THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XI. No. 244—14th YEAR.] LONDON, FEBRUARY 25, 1862. [Subscription per Ann. 15s. in Advance 18s Credit.] Price 8d. Unstamped.

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The Purifiers are 6 ft. by 6 ft. 2 in., with Four Tiers of Grids. The Hydraulic Valve has 8-inch Connexions all complete, with Grids for the Lime.

The whole of the above are equal to new, and are being removed for the purpose of enlarging.

Also, a STATION-METER, capable of passing 7000 cubic feet per hour, with Bye-Pass, Clock, and Tell-tale.

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Apply to Mr. WILLIAM PRITCHARD, Gas Office, ST. HELEN'S.
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Apply to Mr. BRADDOCK, Gas-Works, YORK.

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Retort Mouthpieces, Bolts, Nuts, and every description of Wrought-Iron Work.

JOURNAL OF GAS LIGHTING ONE PENNY NEWSPAPER

LORD REDESDALE'S "SALE OF GAS ACT."

DRY METERS *VERSUS* WET METERS.

LONDON, February 25, 1861.

THOMAS GLOVER begs to call the attention of Gas Companies and others to a few *facts*, which, if duly considered, must lead to most important conclusions :—

1. That since THOMAS GLOVER commenced to manufacture his Patent Dry Gas-Meters (which is now upwards of 15 years), every Wet Meter Maker of any importance in England has been compelled to manufacture Dry Gas-Meters; and in the JOURNAL OF GAS LIGHTING, of date of 12th of February, 1861, Messrs. William Parkinson and Co., successors to the late Samuel Crossley, advertise that they "intend manufacturing *Dry* as well as" Wet Meters, and it is worthy of particular notice that they intend to do so "after 40 years experience in manufacturing Wet Gas-Meters of such a quality that has enabled them, as they say, to maintain a superiority over all other; and this, be it also particularly noticed, after they had advertised in the JOURNAL OF GAS LIGHTING, January 29, 1861, "their improved low-spouted Gas-Meter with new patent float arrangement, which entirely overcomes the difficulty experienced by ordinary Wet Meter."

2. That it is quite consistent with THOMAS GLOVER's knowledge that Wet Gas-Meters, called "low-spouted" or "compensating Wet Meters," have already been proved to be incapable of continuous working or registration, and for this reason the manufacturers of these Meters have been induced to seek the repeal of Lord Redesdale's (righteous) Sale of Gas Act.

3. That every year the Patent Dry Gas-Meter manufactured by THOMAS GLOVER has risen in favour with Gas Companies and Gas Consumers, placing him in the proud position of being the largest manufacturer of Gas-Meters in the country.

THOMAS GLOVER guarantees his Patent Dry Gas-Meters to meet all the requirements of the "Sale of Gas Act," to give accurate and unvarying registration with steady lights; and, from their peculiar construction, cannot be tampered with, and may be fixed in open situations even above or below the level of the lights. They work with less pressure than Wet Meters, and are not affected by the most severe frost.

THOMAS GLOVER guarantees to uphold all Meters sold by him for 5 years free of expense to the purchaser, or for a trifling per centage per annum will contract with any Gas Company to uphold their Meters of his manufacture for a series of years; and, at the conclusion of such contract, to leave the Meters all in perfect working order.

N. B.—Agents in several parts of England are wanted. Apply by letter, or personally.

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(SUCCESSORS TO SAMUEL CROSLEY),

PATENT WET AND DRY GAS-METER MANUFACTURERS, &c.

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W. P. and Co. invite especial attention to this Meter, which entirely overcomes the difficulty to which ordinary Wet Meters are subjected, owing to the short range of the Float, which is necessary, in order to meet the requirements of the Sale of Gas Act.

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Which can be seen at all the London Gas-Works. Also Liverpool, Manchester, Sheffield, Nottingham, Belfast, Glasgow, Birmingham, Dublin, Bristol, Leeds, Leicester, Brighton, Southampton, Sunderland, Wolverhampton, Bradford, Norwich, &c., &c.

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MINUTE CLOCKS, PRESSURE GAUGES, PHOTOMETERS, PRESSURE REGISTERS, &c.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

E. H. B.—*The first section of an Act passed August* 28, 1860, *entitled "An Act to amend the Act for Regulating Measures used in Sales of Gas," contains a proviso, which, in the opinion of the best legal authorities, takes away the powers given to Town Councils and Borough Justices by the Act* 22 *and* 23 *Vict., cap.* 66, *to carry out the provisions of that Act in places where it had not been adopted on the passing of the first-named Act. According to this view, that Act cannot now be adopted in any place in England until the county justices in quarter session shall have resolved to bring the county in which the place is situated under its operation, which has only been done in the counties of Gloucester and Carmarthen.*

NOTICES.

The subscription is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders must be made payable at the Charing-Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

The next number will be published on Tuesday, March 11, and the subsequent numbers on each successive alternate Tuesday.

Stamped copies, when forwarded by post, must be folded so as to expose the stamp; they are otherwise liable to the full postage charge for letters.

This JOURNAL has been duly registered at the General Post Office for transmission abroad.

All Communications to be addressed to the Editor, No. 42, Parliament Street, Westminster; and orders for Advertisements to the Publisher, Mr. W. B. King, No. 11, Bolt Court, Fleet Street.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 25, 1862.

Notes upon Passing Events.

THE indecision of the Metropolitan Board has met its just reward. The Bill and the offer of Messrs. Napier and Hope have both been withdrawn; and, as we anticipated, the fable of the dog and the shadow has once more been realized. For one year, at least, the chance of turning the sewage of London to a useful account has been adjourned: the Metropolitan Board will be fortunate, if so good an offer is ever repeated. Our friend, Alnaschar Ellis, has been more successful in obtaining a way of wasting his only contribution to a company—his time. Through the exertions of his friend and countryman, Dr. Brady, a select committee of the House of Commons has been granted "to inquire into the best means of utilizing the sewage of the cities and towns of England, with a view to the reduction of local taxation, and the benefit of agriculture." A committee to inquire into the potato disease, or the cause of finger and toe in turnips would be just as rational; but, it is the custom of ministers not to deny any non-political committee to our Irish cousins. We remember an instance in which a committee of inquiry was obtained for the express purpose of bringing two or three friends from Ireland to London, at the expense of the nation. In this instance, the Parliament will print a new edition of Mr. Ellis's pamphlet, perhaps, with plans. Dr. Brady's committee room will be a Cave of Adullam, where every schemer will repair to advertise projects, which neither farmers nor capitalists will touch. Seriously, such committees of inquiry into practical commercial subjects are an abuse of parliamentary privileges, and a waste of public money. The affair will end in a Blue Book for the trunkmakers, and a few jollifications for the witnesses from the country. Mr. Cowper, with imaginative powers worthy of his Gamaliel Mr. Chadwick, spoke of the Board of Health romances about sewage as "valuable information."

A committee, composed almost entirely of county Members, has been appointed to consider the Highways Bill, which is intended to make parishes unions for highway purposes, and place them under the control of a paid officer, who will be virtually appointed by the county magistrates. The management of the country roads calls for a decided reform; but, it is very doubtful whether it will be a reform to take the management from the farmers who pay the rates, and transfer it to the magistrates who spend them. Already, there is very widespread discontent amongst the tenant-farmers at the constantly increasing extravagance of the justices of the peace in quarter sessions. The transfer of the control of the highways to the gentlemen who are already so liberal in their plans for gaols and lunatic asylums, and the salaries of captains and colonels who become policemen, will strengthen the agitation for county financial boards, elected by the ratepayers, which Sir Cornewall Lewis so unceremoniously dismissed last session. The farmers are not the illiterate class they were fifty years ago. The men who are fit to be poor-law guardians, are fit to vote the county rates; or, at least, to elect the people who are to spend them. Tenant-farmers are a docile, confiding race, and have a superstitious reverence for any one connected with the squires, even without land. But they are being pressed too hard; and, as highways pass every man's farm, this Highways Bill may prove the last straw, and make the patient Bull turn restiff, and refuse to draw another ounce unless he has something to say to the loading.

Mr. John Lewis Ricardo has given notice of a motion for a committee "to consider the policy of the patent laws," with a view of making out a case for their abolition. When he makes his speech, we shall have something to say to him and his subject.

The Corporation of London have not been able to swallow Mr. Wellington Vallance's new Blackfriars Bridge whole. The advice we tendered from the first has been followed; and the decision deferred, for the purpose of obtaining the professional advice of the City architect and engineer.

The recently-issued report, by Mr. Haywood, the engineer, of works executed by the City Commission of Sewers during the

past year, states that 1596 feet of new sewers were built, of which 1402 were reconstructions on old lines. The number of houses of which some record is possessed as to their being drained, is about 13,184; about 2816 are not known to be drained. The commission paid, for supply of water to urinals, flushing sewers, and washing courts, £433. 8s. 7d. Somewhat less than a hundred dangerous structures have been reported on, and, where needful, made safe. There are now seven drinking-fountains in the City of London, all erected by private benevolence, all very useful, and wretchedly poor as works of art. It is a pity that some of the wealthy City companies will not, out of their vast incomes, spare a thousand pounds for building and endowing a fountain worthy of the City of London; even five hundred pounds would produce something worth attention. For an example of good taste at a moderate expense, there are the buildings intended for fountains, at the head of the water in Kensington Gardens. The inspections of houses of the poor, made under the direction of the medical officer of the City of London, were 9111. More than a thousand were whitewashed and cleaned internally. Certainly, the City of London is paved, lighted, cleaned, supplied with water, sewered, drained, and kept more free of the rookeries and rat-holes of mendicancy, than any other town in the world. Its shop and warehouse architecture is gradually growing very fine; but that improvement in taste is due to private enterprise alone. We have not heard what monument of his double reign Lord Mayor Cubitt means to have; but it is satisfactory to know that he will be succeeded by such intellectual ornaments to civic society as either Sir Henry Muggeridge or Mr. Alderman Rose.

The medical officer and the engineer to the City have also made a joint report "on the results of the experiment of applying charcoal to the sewer-ventilators." The district experimented on includes a space of about 59 acres, with about 1700 houses and about 14,000 inhabitants, and is bounded by Bishopsgate Street, on the west; from Cornhill to Widegate Street, by Middleton Street and Somerset Street, on the east to the City boundary; and by the Minories, and then by Leadenhall Street to Cornhill, on the south—the whole of the main leading thoroughfares being included in the area. The sewers of this district have but a slight fall, and the currents in them are sluggish. The area is closely populated, and has more than an average proportion of resident poor in it. The thoroughfares are mostly narrow, and, therefore, disagreeably affected by the sewer gases which issue from the ventilating gratings. The district affords comparatively good means of isolation from other sewers. The total length of the sewers in the district is 25,587 feet, of which 2081 are pipes, and the remainder constructed of brick, varying from 3 feet high by 2 feet wide, to 5 feet high by 3 feet wide, internal dimensions. In this length of sewer, there are 104 air-shafts, 265 gullies, 15 flushing-shafts, 4 tanks, and 26 side entrances. The whole of the sewers were isolated as much as possible to prevent air-currents passing either to or from adjacent sewers. Two different mechanical arrangements were used for applying the charcoal; one a patent, which consisted of one large sieve with compartments; the other, contrived by Mr. Haywood and Dr. Letheby, consisted of a series of trays for holding the charcoal, so constructed as to be readily removed from the frames into which they were fitted. Wood charcoal, broken into pieces, the size of a filbert, was employed, packed closely, without compression, upon the various trays, and each tray held about a pound and a half of charcoal, making altogether six pounds and a half, distributed over the six trays of each air-filter. The experiment commenced in July, 1860, and is still in operation. But the one filter was put into action in Philpot Lane early in the summer of 1859 (a very dry year), in consequence of a resident medical man having complained of the nuisance arising from the ventilating gratings in that street, where nine or ten deaths had occurred about the same time. This apparatus is still in action, and has continued effective for more than two years. The low temperature and great rainfall of the summer of 1860, checked putrefaction, scoured the sewers, and prevented any satisfactory experiments from being effected. The summer of 1861 was more favourable, from its average warmth and dryness; and the following are the conclusions to which the reporters came:—The deodorizing power has been proved to be complete. There have been no complaints of stenches from the ventilating gratings; and personal observation has convinced the reporters that the smell of the sewer gases disappears when they pass through the charcoal. The charcoal appears to lose much of its power when saturated with water. The charcoal requires removal, in consequence of the moisture it receives and imbibes, long before it has failed as a deodorizer. On an average, the sieves have been recharged once in three months. If the ventilators could be arranged so as to keep the charcoal dry, it would probably not require renewal more frequently than once in a year. The reporters are unable to pronounce a positive opinion on the effect of the application of charcoal on the general ventilation of sewers. It is equally necessary that the sewers should receive a full supply of fresh air for the benefit of the men who work in them, and that the effluvium should not find its way through house-drains into the interior of houses more freely than it does at present. The reporters consider that the danger to workmen has not been materially increased by the application of charcoal filters to what were previously open gratings. Accidents from the gases of sewage, common on the continent, are rare in this country. Five only have occurred in the sewers of the metropolis in sixty years, and caused eighteen deaths. One of these occurred about a year ago, in a new sewer in Fleet Lane, where the fall is great, the flow rapid, the air, wherever examined, fresh; and the cause remains an inexplicable mystery. The four men seem to have died instantly; and rats also were killed. As to whether or not the charcoal ventilators promote the escape of foul gases into houses by way of the house-drains and sinks, there is no evidence; but there has been no complaint of any increase of bad smells. The cost of the experiment has been at the rate of £8. 16s. 8d. per ventilator, and £1. 5s. 3d. per annum for repairs and renewals; but the first cost was increased by the novelty of the undertaking, and the maintenance by the breakages resulting from the heavy traffic of the City. The reporters consider that charcoal filters may be advantageously employed to arrest the odours of house-drains and water-closets. Professional men interested in sewers and drains will do well to consult the original report, which we have been obliged to abridge and condense.

The working of the Adulteration of Food Act in the City of London, gives one more illustration of much cry and little wool. At a meeting of the City Sewers Commission last week, Dr. Abraham said that "various complaints had been made in regard to the adulteration of food and drink, and that, although the commission had gone to great expense in fitting up a laboratory, and had invited the public to avail themselves of the Act, yet, *strange to say, there was not one case of the services of Dr. Letheby, the medical officer, having been called into requisition;*" and he thought that it would be worthy of their consideration to ascertain in what way they could give force to the Act. He then moved, "That it be referred to the General Purposes Committee to consider and report to the commission whether it is expedient to adopt any, and what measures, to give effect to the Adulteration of Food Act?" which motion was seconded and carried unanimously.

Want of candour, a habit of exaggeration and indifference to truth, seem to be chronic diseases with boards of health. In this particular, they still bear the stamp of the arch-charlatan who founded them on Blue Books, in which "a little of the truth, and a very little of the truth," is the text of page after page of fallacious and mendacious reports. The Norwich Board of Health is one of the latest instances of this peculiarity. In August last a chemist, with very faint claims to the title, if we may judge from the difference between his analyses and those of men of acknowledged reputation, took the perfectly justifiable course of advertising himself and his laboratory, by a letter to a Norfolk paper, on the subject of the water supply of Norwich. We say justifiable, because every man who knows anything, and has anything to sell, is justified in seeking customers. Barristers write law books; medical men, when they do not write books, get up a newspaper controversy; and analytical chemists unknown to fame, philanthropically tell their fellow-townsmen "What to eat, drink, and avoid." The Norwich chemist stated that, "the maximum quantity of organic matter that ought to exist in drinking water is four grains per gallon," and that the two samples of the Norwich Water Company's water, which he had examined, contained—the one $11\frac{3}{4}$ grains, and the other 16 grains per gallon. We are not prepared to admit that a population will be poisoned, if after a flood of rain they drink water rather under the average purity, because if this

were so, half the rural population would have been exterminated long ago. But the Norwich chemist, in his vocation, added to his criticism these alarming words:—

Both samples have been examined microscropically by myself, and the latter one by Dr. Eade, and the animalculæ in them are of the most loathsome nature, besides which they contain abundance of infusoriæ, algæ, &c. This state of things ought not to be continued, for there can be no doubt that the use of water in this state is pernicious to persons in robust health; and to invalids, and persons of delicate constitution, it may, at any time, start off a state of disease, the results of which may be very disastrous.

"Probably the reservoir at Lakenham is the source of these impurities—if so, it ought at once to be cleaned out, or else the water should be filtered from it into the pipes which supply the city.

The following week, the manager of the water-works wrote to the editor of the paper that he had "observed a tendency to vegetation in the water supplied by the company," and "therefore took a journey up the river, and found that the millers had not sufficiently cut the weeds, and, what they had cut, were not drawn out, but left to flow down and rot on the surface of the water in the hot sun. Immediate steps were taken to have all the cut weeds taken out; and, with the assistance of the board of health, whose powers will reach the evil complained of, we shall, no doubt, be able to make all the owners up the stream keep the river in proper order in future, thereby insuring that the water shall be of the good quality it has been hitherto. The normal state of the company's water contains 2·33 grains of organic matter per imperial gallon." The water company lost no time in calling in the advice on a subject which of course filled a good deal of space in the dead season in the local papers. On the 25th of September, Mr. Hawksley, the eminent engineer, and Dr. Letheby, the medical officer of health of the City of London, examined the whole course of the water supply; and the following are the more important points of Dr. Letheby's report:—

As Mr. Hawksley has stated in his report, we commenced our investigation by examining the river Wensum, at the point where it furnishes water to the company's works. The river was in excellent condition, for the water was clear and almost colourless, and the vegetation, especially of anacharis, was healthy and clean. We had no difficulty in seeing the bed of the stream through a depth of six feet of water.

We next examined the water after it had passed the engine into the settling reservoir, and here also the water was bright, and the reservoir was clean and free from vegetation. A sample (No. 1) of the water was taken at the inlet of the reservoir for analysis.

The course of the water was then followed to the filter-beds, and its condition was carefully examined, not only in the beds before filtration, but also in the supply-tank after it had passed the filter. In the former state, the water was remarkably free from confervoid growth, and the filter itself appeared to be unusually clean. In fact, we were surprised to hear that it had been in action for a fortnight, and was then about to be discontinued, the new filter-bed being ready for alternate use. That the action of the filter was not exhausted was manifest, not only from the condition of the water which had passed through it, but also from the fact that the height of the filtered water in the supply-tank was only a foot below the level of that in the filter-bed. Indeed, the water in the filter or supply-tank was so clear, that the pebbles at the bottom of it were easily seen through a stratum of ten feet of water. A sample (No. 2) was taken from the tank for analysis.

Our next proceeding was to follow the course of the river to a distance of about eight miles above Heigham to Taverham Mill; and that which struck our attention was the absence of land vegetation, as well as human habitations along the river banks. There did not appear to be any source of impurity or pollution beyond the decay of its own luxuriant aquatic vegetation which had been recently cut, and which still floated upon the surface of the stream. We remarked that the water was bright and clear, the fish abundant and healthy, and the plants clean and vigorous. At Taverham there is a paper-mill, where portions of the pulp fibre, and pump liquor, containing a small quantity of chloride of lime, as well as the washings of the boiled rags, are discharged into the stream; but the quantity of foreign matter mixing with the large body of water that passes the mill, was too small to be a source of injury to the river; for not many yards below the mill the water was again bright, and free from perceptible impurity

Above the mill, the bed of the river is evidently kept in better condition than it is below, there being a more careful and complete removal of the aquatic plants. A sample (No. 3) of the water was taken at a short distance above the mill, for the purpose of comparing its quality with that of the water supplied to the water-works.

Lastly, we inspected the reservoir at Lakenham, from which the city of Norwich is directly supplied. The reservoir was quite full of water, which was bright and colourless, except at the margins of the reservoir, where it was slightly turbid, in consequence of the scouring action of a recent heavy fall of rain. The surface of water was perfectly free from confervoid and diatomacious growths, and the reservoir itself was peculiarly clean. A sample (No. 4) was taken from the reservoir for chemical examination.

On my return to the Royal Hotel, I examined the condition of the water as it was supplied at the common tap in the stable-yard, and I found it to be of the same unexceptionable quality as that in the Lakenham reservoir. A sample (No. 5) was taken from the tap for analysis.

Directly after my return to London, all these samples were carefully examined. They were first tested by means of a beam of light, sent through a column of the water eighteen inches in length, and the tint of the colour was contrasted with the pellucid appearance of a similar body of distilled water. No. 1 and No. 3, the two samples from the river, had a marked greenish-brown tinge from the presence of organic matter, but the other samples were nearly colourless.

The samples were then tested with a standard solution of permanganate of potash, and again there was evidence of a larger proportion of organic matter in samples Nos. 1 and 3 than in the others.

The hardness of the water ranged 14·8° of Dr. Clark's scale, and 14°; and, after the water had been boiled for ten minutes, it fell to about 8°.

All the samples of water were without action on lead, even after a week's exposure to the metal.

The general indications from these results are:—

1. That the water of the river Wensum is not largely charged with organic matter, and that it is entirely free from sewage, or such-like drainage—the presence of nitrates being almost imperceptible, and that of ammonia completely so,
2. That there is no material difference in the composition of the river-water at a little above Taverham Mills, and at Heigham, where it is pumped into the company's works.
3. That, after the water has passed the filter-beds, it has lost nearly half of its organic matter, as well as all its suspended impurities—the proportion of organic matter being reduced from nearly three grains in the gallon to about a grain and a half.
4. That the water is not materially altered in composition from the time it leaves the filter-beds to the delivery of it at the public taps.
5. That the water does not contain an excess of mineral matter, and is not particularly hard, its hardness being almost the same as that of the best water supplied to London. Moreover, as the hardness is chiefly due to the pressure of carbonate of lime, it is but temporary, and is lessened by ebullition, when the hardness falls from 14° to 8°, or even lower.
6. That the water is without action on lead, and may, therefore, be stored with safety in lead cisterns, and distributed by lead pipes.

Looking at these results, I have no hesitation in saying that the water supplied by the company to the city of Norwich is excellently well suited for domestic and general use. In point of fact, if it be compared with the water supplied to the metropolis, it will be seen to be a good water; and, further, it seems to have undergone improvement in its quality since it was examined, in 1850, by Mr. Phillips.

Two days after the receipt of the reports by the directors of the water company, in September, 1860, they were communicated to the board of health, who had previously received and published an alarming report from their inspector of nuisances. It might have been expected that the board of health would, as a duty to the district under their charge, have published an authoritative statement, to soothe the alarm of the water-drinkers. Not so; they carefully suppressed all reference to a document which would have damaged the scientific reputation of their friends and officials; and it was not until the annual meeting of the water-works company, in February, 1862, that Dr. Letheby's conclusive report found its way to the press in an authorized shape. The duties of boards of health are most important. Pity it is, that they so often fall into the hands of quacks, charlatans, and empty parish orators!

In the *Révue Scientifique des Deux Mondes*, M. Barral points out that the New Hartley catastrophe—the result of working a great pit with only one shaft—is only the sequel of several others, where lives were sacrificed to the same cause. In 1835, at Wallsend, 102 persons lost their lives by an explosion of foul gas, half of whom might have been saved had there been a second shaft. The greater number of the victims at Jarrow were in the same plight. In 1815, a mine was drowned at Heaton, and 75 persons, who had escaped from the water to an upper gallery, were starved to death, after eating their candles and a pony. Public opinion is stronger—the ties between employers and employed are closer—than at any period of our previous commercial history; and there is no doubt that, even if a legislative remedy were not applied, local opinion would compel the northern coal-owners to double-shaft their dangerous pits. In this country, public and private interests sometimes suffer from our, often well-founded, prejudice against Government interference and fear of over-legislation. Yet our children and women in factories are better protected, and the latter better educated, than on the continent, where, until very recently, the hours of labour were unlimited, and women were permitted (as they still are in Belgium) to work underground.

In some very important respects, the dreadful catastrophe at New Hartley gave occasion for a triumph of the English non-official system. There was no waiting for the orders of a Prefect or a Chief of Police; the work of rescue was carried on with all the advantages of perfect discipline and perfect order by the miners and their usual chiefs, the *viewers* or foremen. No magistrate or policeman interfered, or was required. The Queen's telegram was delivered direct to a private individual, the leader of the working party. All worked as a duty, and none expected crosses, ribands, or other official baubles. When all was over, and only the sad duty remaining was to support the destitute widows and children of the victims, there was no thought of appealing for Government aid—private benevolence did all. The nobility, the bishop, the clergy, the mineowners, the townspeople of the locality, met first to raise the needful funds; while the working men met also, and in temperate resolutions called for inquiry and a remedy. They cross-examined the Government official inspector, and, not being a Prussian, he was not offended, and being in England,

there was no thought of prosecuting the remonstrants for insolence to official authorities. The sum estimated to be required for the survivors of the poor men was about £20,000. The nation has subscribed £50,000, of which upwards of £17,000 has been raised in the Durham and Northumberland districts. These are strong evidences of the healthiness of our English social system, and the success of the "great let alone principle." M. Barral, usually so well informed on English affairs, falls into a mistake in complaining that the Queen, who sent her condolences as a Queen, widow, and mother, to the victims, did not promise also a law protecting miners against the recurrence of such accidents. The Queen has no such power—that rests with her responsible ministers.

The fourth number of the *Annales des Mines de* 1861, gives a continuation of the report of MM. Gruner and Lau, "on the present condition of the iron manufacture in England," which is full of useful matter. For the best accounts of our most important manufacturing operations, we must refer to French and German authors. As long as they confine themselves to descriptions of operations and machinery, they are clear, eloquent, and accurate. It is only when they attempt to describe the men that they make such coarse blunders, as the great M. Le Play in his monogram of the British workman. MM. Gruner and Lau consider that the manufacture of coke in England, is in much the same state that it was twenty-five years ago, with the exception of some attempts to extract tar, and inferior to the improved methods used in the furnaces, (*fours*) of Appold and Knab, in France, and in the rectangular furnaces in Belgium. They state that the gases emitted in smelting iron are seldom collected.

Circular to Gas Companies.

The Bill introduced in the House of Commons, under the auspices of the corporation of London, for excluding the City from the operation of the Metropolis Gas Act, 1860, was appointed to be read a second time on Thursday last; but that stage of progress has been deferred, at the instance of the promoters, for a fortnight. They have, no doubt, ascertained the disinclination of Parliament to disturb the compromise between the metropolitan gas companies and their customers, effected in 1860, especially when it is proposed to do so by passing an Act, the tendency of which would be to place the City of London in comparative darkness. The promoters of the Bill have sufficient discretion to know that, by pressing it on an unwilling House, they would add to the risk of its rejection; delay, therefore, seems to be the best policy. In the time that is thus allowed for further consideration of the opinions of the judges of the Court of Common Pleas—who were unanimous, not only with respect to the legality, but to the justice of the Great Central Company charging a higher price for gas of a superior quality—the Commissioners of Sewers may take more reasonable views of the question, and cease to be misled by the violent and fallacious invectives of agitators. An altered tone is, indeed, perceptible in the discussion at their last meeting, which affords ground to hope that the disagreement between them and the company may be settled amicably on an equitable basis. Of course, the price of 4s. 6d. fixed by the Metropolis Gas Act must be maintained, now that the question, whether that Act overrides the Great Central Company's special Act, has been decided in the affirmative; but, on the question of meter-rents, and several minor points, there are ample materials for a compromise, which it is to the interest of all parties should be effected. The most strenuous advocates of the interests of the Great Central Company cannot fail to admit that the citizens have an equitable claim on them for something more than the strict requirements of the law; and, though they may now legally charge rents for the meters they provide, it would be straining their right to do so, inasmuch as they were bound by one of the provisions of their Act to provide meters free of charge, and the Metropolis Gas Act imposes no obligations regarding meters, which render compliance with the original provision more onerous than before. There can be no doubt, also, that the company are practically placed in a better position when charging 4s. 6d. per 1000 feet for 12-sperm-candle gas; because, though not actually required by their Act to supply gas of higher illuminating power than 12 wax candles, it was almost necessary, in competition with the other companies, to manufacture gas of a better quality. These considerations would, we imagine, operate on the minds of the directors, and induce them to grant concessions in a liberal spirit, if there be a disposition on the part of the corporation to enter into an amicable compromise. The citizens would, most assuredly, gain more by the adoption of such a course, than by persisting in the hostile attitude they have inconsiderately assumed.

The Highways Bill, introduced in the House of Commons by the Government, has been referred to a select committee, by whom the arbitrary powers proposed to be granted to the Highway Boards, to be established in each district, will have to be considered. The only point to which we shall now call attention, as bearing on the interests of gas and water companies, is the power that would be given by the 19th clause to the Highway Board of each district to level, or alter the course of any highway, if they think it expedient, or to do "any works in respect of highways that may be for the convenience of the public." By the unrestricted exercise of this power, a Highway Board might put gas and water companies to considerable expense in altering the direction or the level of their mains, but the restrictions on the formation of the highway districts to be governed by the Boards are so many that the operation of the Act would be limited to a comparatively small portion of the kingdom. The exceptions include Scotland, Ireland, South Wales, and the Isle of Wight; also, any district constituted under the Public Health Act, 1848, and the Local Government Act, 1858; any parish included in the Highway Act passed in the reign of William IV.; any parish within the limits of the metropolis; any parish the highways of which are maintained under the provisions of any local Act of Parliament; and, as regards boroughs, it is provided that no parish or part of a parish within the limits of a borough, shall be included within any highway district without the consent of the council of such borough and of the vestry of the parish. These very contracting restrictions will limit the formation of highway districts and the jurisdictions of the Boards proposed to be formed within an area not much traversed by gas or water mains. The following is a copy of this clause of the Bill:—

> The Highway Board shall maintain in good repair all highways within their district, and protect the same from encroachment; they may also, if they think it expedient, make any improvement in respect of the highways within their district, by widening or levelling (for the purpose of making the same more convenient to the public), by altering the course of any highway, or doing any works in respect of highways that may be for the convenience of the public; and, subject to the provisions of this Act, every Highway Board shall, as respects the highways in each parish within their district, perform the same duties, have the same powers, and be liable to the same legal proceedings as the surveyor of such parish would have performed, and had been liable to, if this Act had not passed.

The Town Council of Leeds, not being deterred by the warning example of Bolton, have resolved to seize the opportunity, of the application to Parliament by one of the gas companies of the town for further powers, to attempt to obtain possession of the gas supply, for the purpose of municipal taxation, according to the Manchester system. The supply of gas by the corporation of Manchester has been a stumbling-block to most of the local authorities of the kingdom, who fail to perceive the great difference between the circumstances which have rendered it possible for the commissioners and the corporation of that town to manufacture and supply gas with advantage, and the circumstances in which those public bodies are placed, who now wish to adopt the same system. The street commissioners of Manchester undertook to light the town with gas at a period when gas lighting was a novelty, and they commenced, therefore, with a clear field before them. They were enabled to construct the necessary works by borrowing money at a comparatively low rate of interest, on the security of the town rates; and they might thus have lighted the public lamps, and supplied gas to private consumers, at a lower rate than could be done by a private company, who would require to be remunerated for the risk incurred by ample dividends. But, even under such favourable circumstances, the Manchester system has proved a failure. It is true that large sums of money were annually appropriated out of gas profits for improvements in the town, and for the reduction of the water-rate; but that money was extracted from the pockets of the gas consumers by charging them a much higher price than was charged in Liverpool, and in other large towns similarly situated, that are supplied by private enterprise. When the undertaking of an existing gas company has to be purchased by a corporation, the shareholders, of course, expect to receive

an equivalent for the profits they may reasonably expect if the works continue in their hands; and, after the payment of the purchase-money, the surplus of profit, on deducting the interest on the money borrowed, would be inconsiderable, even if the works were well managed, and, if otherwise, the profits would not be sufficient to pay the interest. Thus, in the case of Leeds, the dividends paid on the largest portion of the capital of the company are 10 per cent., and the market value is £180 for every £100 of old stock. Supposing, therefore, the shareholders were disposed to sell at that price, the interest on the borrowed money would nearly swallow up all the profits. The Bolton corporation attempted to compel the shareholders of the Bolton Gas Company to sell their property for less than its market value by threatening to establish a competing company; but in that attempt they were completely defeated, and the sanction Parliament gave to the purchase of the works was clogged with the condition, that all profits arising from the undertaking should be applied to gas purposes, and not to town improvements. The ratepayers and gas consumers of Bolton are now paying the penalty of that abortive attempt by the corporation to get possession of the gas-works, the money expended on the occasion having amounted to about £10,000. The Town Council of Leeds ought to be cautious, after this warning, in spending the funds of the ratepayers in endeavouring to obtain possession of the supply of gas, for there can be little doubt that the principle which guided the Bolton committee will serve as a precedent in future cases, and that the application of the profits, if any, arising from the supply of gas, will be restricted to the benefit of gas consumers.

Mr. Hughes is ubiquitous in his efforts to turn to account the reputation he gained as gas agitator when honorary secretary to the promoters of the Metropolis Gas Act. We hear of his circulars being sent in all directions, for the purpose of exciting discontent, and to induce the local authorities to employ him to effect a reduction in the charge for public lighting. He has been invading the ground recently occupied by his co-agitator Mr. Flintoff, at Stirling, and we hear of him also in Lincolnshire; the Improvement Commissioners of Spalding having been favoured with one of his inflammatory missives. In neither of those places, however, do his services appear to be appreciated, and the apparent inconsistency of his statements to the local authorities of different towns tends to throw discredit on the information he officiously volunteers. In the circular addressed to the town-clerk of Stirling, for example, he states that according to the average of the whole kingdom, the price for gas in the public lamps should be only 3s. 9d. per 1000 feet, while in the circular sent to the local authorities of Croydon, which we before noticed, the average was stated to be 4s. 1½d. The far-seeing royal burghers of Stirling, who refused to be led astray by the eloquence of Mr. Flintoff, were equally firm in resisting the seductive circular of Mr. Hughes, though it arrived at a time when the Town Council were disputing with the gas company anent the price to be paid for the public lamps; and some of the members wanted to know who the Mr. Hughes was who thus interfered in their concerns. At Spalding, he was equally unsuccessful, and met with a more direct rebuff. The circular was sent to the Improvement Commissioners *à propos* to nothing, for there was no question about public lighting before them, with the existing condition of which they were perfectly satisfied. Their clerk was directed to inquire why the circular had been sent; and, thereupon, Mr. Hughes forwarded a list of prices charged for public and private lighting in various towns, and offering his services to the commissioners to assist them in obtaining a reduction of the price of gas in Spalding. His offer was rejected, and the chairman gave a very sensible reply to Mr. Hughes's comparison of the prices of gas in different places, by contrasting the conditions of gas supply in a small town like Spalding with those of Lincoln, to which Mr. Hughes had referred. He said, also, that taking into consideration that the proprietors of the Spalding Gas Works provided the lamps, and undertook the lighting, cleaning, and repairing, the price actually charged for the gas supplied to the public lamps was less in proportion to the price paid by private consumers than in Lincoln. We hope that Mr. Hughes's firebrands will be as effectually extinguished in all other places where they may be thrown. We observe, notwithstanding our rebuke for his scandalous charge of fraud against all gas companies, that he has not erased the calumnious paragraph from his circular.

The Metropolitan Board of Works are making rapid progress in squandering the ratepayers money, in their attempts to put the Sale of Gas Act in operation. They have, though not without strong opposition, given a gratuity of £100, with an advance of salary, to Mr. Cresy for his successful efforts in expenditure, and, as it now seems that the works for permanently locating the inspectors cannot be executed for the estimates, the proposed enormous sum of £15,000 to be expended for that purpose will be exceeded. Whilst this extravagant outlay is going on in the erection of offices, it seems doubtful whether the fees received for stamping meters will meet the current expenses; for, owing to the active competition of the City inspector, some of the officers appointed by the Metropolitan Board have now little to do. When Mr. Taunton's opposition testing shop is opened at Kingston-on-Thames, the number of new meters sent to them to be tested will be further diminished, and they will have to look for occupation to the testing of the meters of discontented consumers, which class of business must, of course, be limited to the districts of the inspectors.

Our attention has been directed to the practice, still prevalent in many parts of the country, of cutting off the supply of gas as a means of enforcing payment of quarterly accounts, by receiving a printed announcement from a gas company in a small provincial town of a reduction in the price of gas, to which notice there is appended the following *nota bene*; "In consequence of the inconvenience arising from parties not settling their accounts when due, the manager has received instructions to cut off the supply of gas to any consumer whose payments are more than one quarter in arrear." Such a threat is as impolitic as it is discourteous. It must tend to discourage the extension of gas lighting, and to excite a feeling of hostility, which it is most desirable on all accounts to avoid. The County Court offers a ready means for enforcing payment, if compulsory measures be necessary; and the cutting off the supply should be reserved as a last resource against fraudulent customers, and not be set forth as an ordinary means of obtaining payment for running accounts.

Communicated Article.

THE INFLUENCE OF BENDS ON THE MOTION OF FLUIDS THROUGH PIPES.

By William Pole, Esq., F.R.S., Mem. Inst. C.E.

About ten years ago, a communication from me, on the motion of fluids through pipes, was inserted in the Journal of Gas Lighting, and I am glad to know that it has been found useful by many engineers and others interested in matters of this nature.

I now send a note on the particular branch of the subject named above, which has always been somewhat obscure, and on which it is therefore desirable to get all the light we can.

The following remarks in my original paper will serve as an introduction to those I am about to offer:—

Bends in the pipe have also a tendency to reduce the velocity, and, consequently, to lessen the discharge. It is evident that, if a sharp bend occur in a pipe in which a fluid is moving with considerable velocity, the particles, being suddenly diverted from the right line in which they naturally tend to move, will be caused to eddy, or become agitated among each other; and thus, as before explained, a portion of the *vis viva* will be absorbed, and the velocity to some extent reduced accordingly.

The investigation of the increased resistance arising from bends has been attempted by mathematicians, but with very little success. The ordinary formula, as used by English writers, is as follows:—If v = the velocity of the fluid in the pipe, ϕ = the angle of the bend, and h = the head of water necessary for overcoming the additional resistance caused by the bend; then

$$h = A\, v^2 \text{ Sin. } \phi,$$

where A is some constant.

It only requires, however, a very simple examination, to show that this formula is, on the face of it, inapplicable and absurd.

In the first place, it is well known to all who have had to do with pipes, that, in ninety-nine cases out of a hundred, the bends are not made sharp elbows, but are more or less curved; and it is a fact consistent alike with experience and with common sense, that, in proportion as the bend is curved with a larger radius, its disturbing effect upon the passage of the fluid becomes less in amount, until, if the curve be much expanded, the additional resistance may be said practically to vanish altogether. Now, the above formula contains no element whatever representing the radius of the bend; and, therefore, it would give the same resistance for a sharp elbow as for a curve of any radius whatever, no matter how large.

Secondly, it stands to reason, that two bends of any given angle, placed together, should give double the resistance caused by one of them alone; at least, it is difficult to imagine any reason why it should not be so; but this does not accord with the rule, according to which the resistance of a bend of 90° would be only 40 per cent. greater than one of 45°!

Thirdly, above a right angle, the sine *decreases* as the angle *increases*; so that, by the rule, provided the bend be above 90°, the resistance would appear to become less as the bend becomes greater, until at 180°, *i. e.*, with a bend of a complete semicircle, it vanishes altogether!

It is certainly marvellous, that a rule of such a preposterous nature, and

producing such evidently absurd results, should for a moment have been received or promulgated. The fact is, that the English writers on hydraulics, in copying from Dubuat, who established a rule for the resistance of bends, have misapplied a quantity which he termed the "*angle de réflexion*," by substituting for it the angle of the bend; and have thus misinterpreted his views, and introduced a rule altogether inappropriate to the case in point. It could be easily shown that, by a correct application of Dubuat's principle to curved bends, a formula might be deduced which would be free from the defects of the one above named, and would appear to be reasonably applicable to the case in question; but as, unfortunately, we are not in a position to test it by experiment, we should be acting at variance with the principle on which we set out, to recommend it for use in practice. The few experiments which have been made upon the effect of bends do not appear to lead to any satisfactory result; and M. D'Aubuisson, whose researches on fluids are of great authority, was compelled to acknowledge that his attempts to establish a rule for them had all been in vain.

We are inclined to believe that, in ordinary cases, if the bends are constructed with a radius tolerably large in proportion to the diameter of the pipe, the resistance is but of trifling amount; but that it may be considerable if the angle is sharp, and the velocity high.

Now, in a late number (Jan. 6, 1862), of the *Comptes Rendus*, M. de St. Venant has taken the trouble to do what, in the above passage, I suggested might be done—namely, has deduced from Dubuat's formula a rule simple in its application, and apparently correct enough in its results, to serve, fairly at least, for use, until a better one can be obtained.

The reduced formula for water is as follows:—

Let d = diameter of pipe.

λ = length, ρ = radius } of curve, measured upon the axis of the pipe.

v = mean velocity of passage per second.

h = head of water necessary to overcome the resistance caused by the bend.

Then, if the dimensions are in French mètres:—

$$h = \frac{v^2 \lambda}{204 \rho} \sqrt{\frac{d}{\rho}}$$

Or, in English feet:—

$$h = \frac{v^2 \lambda}{670 \rho} \sqrt{\frac{d}{\rho}} \quad \text{nearly.}$$

The author remarks that such a formula is reasonable in its form; for the factor $\frac{\lambda}{\rho}$ expresses the total deviation or *angle* of the bend, while that $\sqrt{\frac{d}{\rho}}$ offers a measure of its *suddenness* or sharpness (*raideur*); its half expressing the ratio which a versed sine $\frac{d}{2}$ bears to the chord $\sqrt{\frac{d}{2}} . 2\rho$ of the corresponding half arc of the circle.

A comparison is given of the results of the formula with those of experiments on bends in pipes of about 1 inch and 2 inches diameter; and, as far as these go, the agreement appears satisfactory, but there is room for experiments on a wider range.

It is suggested, that the formula may apply also to canals, by making d = the breadth of the stream; but there are no experiments to test this applicability.

An example of the application of the formula will give an idea what the resistance due to a tolerably sharp bend in a water-pipe amounts to.

Take a pipe, 1 foot diameter, with a current of water flowing through it at the rate of 5 feet per second; and suppose that a quarter bend (90°) occurs, of 1 foot radius. We shall here have:—

$$h = \frac{5^2 \times 1 \cdot 57}{670 \times 1} \sqrt{1} = \frac{1}{17}$$

i. e., the head of water necessary to overcome the resistance due to such a bend will be 1/17th of a foot, or not quite three-quarters of an inch.

For fluids other than water, we can, in the present state of our knowledge, only assume that the resistance caused by the bend will, like the friction, vary as the specific gravity of the fluid. If we make

p = pressure in lbs. per square foot necessary to overcome the resistance caused by the bend.

S = weight of a cubic foot of the fluid in lbs.

Then, since $h = \frac{p}{S}$ we shall have

$$p = \frac{S v^2 \lambda}{670 \rho} \sqrt{\frac{d}{\rho}}$$

applicable to all fluids.

Westminster, Feb. 1862.

IS GAS-LIGHTING DANGEROUS?

By J. O. N. Rutter.

Some subjects—topics only of common conversation—it is the wisest and safest course to let alone. They soon wear themselves out, and are forgotten. Others which, in various ways, are kept before the public, may not in reality be of much importance, and yet ought not to be permitted to pass unnoticed. Those things which are least understood, almost always create the strongest prejudices; and, as long as ignorance remains, the prejudices are perpetuated. It seems as if some of these prejudices would never die out. From time to time they are revived, repeated, and republished with all the gravity and oraculousness of new discoveries.

After making large allowances for defective information, for official bias, and for, probably, something akin to disinclination to examine all sides of a question, I cannot but think it unfair, so unfair as to amount to injustice, for any one to talk, and write, authoritatively about gas-lighting being dangerous.*

Of all classes of statistics, those professing to explain the causes of the fires which annually occur in the metropolis, are the least satisfactory. No doubt great care is exercised in collecting information, and all that can be done is done in trying to get at the truth. Let it be remembered, however, that for years past it has been the practice to ascribe to "gas," the principal part of the unexplained fires, and so it has had to bear a vast deal more than justly belonged to it. Whatever may be the proportion of fires actually chargeable to the use of gas, those which are accidental, or, in a certain sense, unavoidable, ought to be distinguished from those occasioned by wilful carelessness, and culpable negligence. In the latter cases, the persons who have misused or misapplied the gas have been "dangerous," not the gas itself.

All kinds of combustible materials are dangerous. Fire in its various forms, without flame and with flame, and whether employed for heating or lighting, is dangerous. Open fire-places, enclosed stoves, heating by air and water, ovens and furnaces, gas-lights, lamps, candles, and lucifer matches, are dangerous. Who, in his right senses will deny this? But, with so many dangerous materials, and dangerous processes, about us, the world has gone on; and the accidents, costly and calamitous as some of them have been, are, comparatively, few in number.

In the use of heating and light-giving materials, and in their application to the innumerable processes of trade, manufactures, and social life, what is it which constitutes immunity from accidents? Is it not because some of the materials are more easily managed than others? In themselves they are as dangerous, but, in their application, the elements of safety greatly outnumber those of danger. In actual every-day practice, it is next to an impossibility to derange or interrupt the successful operations of some kinds of combustible materials; whilst others are at any moment liable to go wrong, and, with the most attentive supervision, they often do go wrong.

In helping to promote the use of gas, the question uppermost in my thoughts, during thirty years, has been, not whether gas is dangerous, but whether, in its right application, it is attended with fewer risks of accident than any other material? This question has long been settled. I believe it to be impossible to overestimate the benefits of gas, when comparing, or rather contrasting, it with other light-giving materials, and solely on the principle of safety. If all the ordinary kinds of light-giving substances are more or less dangerous, is it not reasonable, as well as desirable, to make a selection? This has been done. The public—manufacturing, commercial, social—have declared in favour of gas; and, to an extent which probably will never be, even approximately, represented by figures. What avails it to try to resuscitate old-fashioned and obsolete prejudices? Who will listen to them, or who will believe in them?

Gas-lighting must not be looked at hastily, nor only in its commonest and most familiar aspects, if we would come to a right conclusion as to its superiority in respect to safety. A good-sized well-lighted shop, or warehouse, or manufactory, or printing-office, or private dwelling, is an example of the advantages of gas under favourable conditions. In passing along the streets, the thousands of burners of various forms and sizes, which are seen so closely mixed up with fragile and combustible materials, may seem to convey a notion of danger. But it is not so. Accidents from such causes are extremely rare. Practice and experience may be relied on. The risks are smaller than they appear to be.

Those who wish to magnify, or, as I ought to say, exaggerate, the dangers of gas-lighting, should dive below the levels of the streets, and witness what is going on in vaults and cellars, kitchens and workshops, packing-rooms, and warehouses; where the floors are strewed with paper, straw, and shavings, and every available space filled with bales, boxes, and casks; whose contents, in many instances, are as inflammable, and a hundred times as dangerous, as the gas which illuminates them. Then, it may be well to remember the class of persons to whose care and management gas-lights are intrusted; and what a continuous stream of young and inexperienced persons is daily flowing towards the metropolis and all the large cities and towns in the kingdom. Many of these have, in a few days, and sometimes in a few hours, to take care of their masters' and mistresses' property, and to light and put out the gas, although they may never have done so before.

If further proof be needed that gas-lighting is not dangerous, let us think of the piles of buildings in the manufacturing districts, and the processes carried on in them; where the number of burners

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* See Journal of Gas Lighting, Feb. 11, 1862, p. 75.

and the gas consumed in one of them are equal to what are required in a moderate-sized town. We may also try to think of the probable number of burners, the thousands of millions of cubic feet of gas, and the quantity of light obtained from it; and then we may ask where the tallow, or oil, or other materials, are to be obtained to supply its place, with light so pure, so healthful, so cheap, and so free from danger?

Black Rock, Brighton, Feb. 17, 1862.

Correspondence.

NAPHTHALINE IN GAS-MAINS.

SIR,—"A Manager" asks me if, in addition to telling him how to get rid of naphthaline, I will also tell him how to prevent its formation, and thus prove that "prevention is better than cure?"

"A Manager's" question reminds me of another adage which I have heard—how that in a minute a fool may ask as much as it will take a wise man an hour to answer.

Now, although I do not wish to apply these epithets to either of us, "A Manager" has asked a question on a somewhat controverted point, which I do not pretend to answer definitely; but, if he will attend to the following, he will not be much troubled with naphthaline:—produce gas of good illuminating power—say, not under 12 candles; prevent its being reduced in temperature below 50 degrees; do not absolutely remove all the ammonia, or spoil the gas by too frequent washings through cold water; avoid pipes that have rough interiors; also, all abrupt bends, or any thing that interferes with a steady and continuous flow of the gas.

When these precautions have been attended to, I have had no trouble with naphthaline worth mentioning.

GEORGE ANDERSON.

16, *Adam Street, Adelphi, Feb.* 24, 1862.

Register of New Patents.

1803.—JAMES TRIGWELL, of Terminus Street, Brighton, engineer, for "*Improvements in slide-valves.*" Provisional protection only obtained. Dated July 17, 1861.

The object of the present invention is to relieve slide-valves, whether employed for the admission of steam or fluids under pressure, from the pressure acting upon the back or top sides thereof, which, in the ordinary slide-valve, produces greatly increased frictional wear and tear on the working faces, more especially in locomotive engines, where a great increase of working pressure has from time to time to be made. The removal or transfer of the pressure from the back of the moving slide-valves, or the placing of it in a state of equilibrium for working purposes, is effected in the following manner:—Upon or to the back of the slide is cast or attached carriage-pieces or guides for the purpose of holding in position a cylinder closed at the top. There is connected or fixed to the back of the slide, at the centre or elsewhere, or in more than one place, a rod, stud, or connexion, by which a piston or disc, made to accurately fit the cylinder is connected therewith. The cylinder, with its steam-tight piston, being thus connected with the moving slide-valve, travels backward and forward with it; but the cylinder is supported, maintained in position, and guided by means of rods worked in fixed bearings, side-guides, or other mechanical equivalents. A communication between the interior of the cylinder and the external atmosphere is effected by means of a small pipe fitted to the cylinder, and working through a stuffing-box in the slide-chest or inside thereof; if preferred, one of the guide-rods may be hollow. Instead of a metallic packed piston being employed for working within the equilibriating or back-pressure cylinder, a flexible diaphragm may be attached to a plate-piston, and to the sides of a cylinder, steam-tight, so as to receive the pressure of the steam admitted into the valve-chest. The equilibriating cylinder, its piston and connexions, and the means of securing and guiding, are contained within the valve-casing; and the steam, whilst it acts upon the back of the slide-valve, is also, through the arrangement described, caused to pass upward and raise the piston or its equivalent, which may be of any suitable area.

1834.—MICHAEL HENRY, of 84, Fleet Street, London, patent agent, for "*Improvements in the method of, and apparatus for, obtaining an increased effect from lights.*" A communication from Charles François Lepage, and Cyprian Poisson. Patent dated July, 20, 1861.

The object of this invention is, to obtain an increased effect from lights. For this purpose, one, two, or more lenses, discs, or lenticular bodies or appliances, are employed, which act as "projectors," and are placed very near to the luminous agent or light, whose effect they are to augment. These projectors are formed of glass, or some transparent material, and preferably for one convex and one flat surface, or both surfaces may be flat, one surface being smooth, while the other surface is corrugated, indented, undulated, serrated, fluted, or striated, which sort of surface, to avoid repetition, is called the uneven surface. This uneven surface may be striated like De Grand's lighthouse lenses, or it may be partly serrated and partly fluted. In one form, for example, the projectors may be like a sort of disc or plate, with one surface smooth and flat, and the other, or opposite surface, uneven. In another form, they may be of the plano-convex shape, the convex side being smooth, and the opposite side either smooth or uneven; the smooth face, whether plain or convex, being that which is placed towards or nearest to the light. The projectors are, in some cases, placed with advantage about two inches from the light, and in others from about four-fifths of an inch to one inch from the light. According to one mode of mounting them, they may be fitted near the light on arms or brackets attached to a collar, which is placed on the burner or convenient part of the lamp, lightholder, or lighting appliance or apparatus, and which is furnished with a screw, or other adjusting means, by which the projector may be raised or lowered at pleasure. Round or cylindrical projectors may be applied to or form part of lamp-glasses. Thus, the lower part of the glass or chimney may have a corrugated, striated, or uneven outer surface formed with the glass, or a projector with uneven outer surface applied thereto, to produce the required effect.

1841.—JOHN BEATTIE, of Lawn Place, South Lambeth, Surrey, engineer, for "*Improvements in buildings and ships, with a view to the extinguishment of accidental fires therein, and also the ventilation thereof.*" Patent dated July 22, 1861.

This invention consists in applying in, or between, or connected with the brickwork, or other material of which the main building is composed, one or more pipe or pipes of suitable metal, and of sufficient strength and bore, from the basement or ground-floor to the roof, or other parts of such building, with branch-pipes of suitable metal, bore, and strength, from such main-pipe or pipes, into each floor, and, if required, into each room, such branch-pipe being carried round the ceiling, or other part or parts of such rooms, and other parts of the building, with perforations in such branch-pipes, and mouths or roses, made ornamental or otherwise. There are suitable joints or cocks, or other apparatus, so that, when a fire has taken place in one or more of such rooms, the water can be forced by steam or other power from below, through the main-pipe and branch or branches, into such rooms as required for the extinguishment of the fire therein. In some cases, also, flues are constructed in different parts of the building for the passage of water for cooling the walls, and pipes with requisite inlets and outlets. At other times, the air is forced or partially exhausted by means of a fan, or other suitable apparatus, worked by steam or other power through the main and branch-pipes for the purpose of ventilating the rooms in such building. The arrangement of such main-pipe is also applied from the decks or other convenient parts of ships, with smaller branch-pipes into the various cabins, the saloons, between decks, holds, and other parts thereof, for the extinguishment of fire, and also for purposes of ventilation.

1909.—BENJAMIN BROWNE, of 52, King William Street, London, patent agent and civil engineer, for "*An improved self-acting tap or apparatus for the convenient passage of lighting gas, or other illuminating fluid or liquid, aad particularly adapted for lighting cigars.*" A communication. Provisional protection only obtained. Dated August, 1861.

This invention consists of a bent tube, intended to be screwed against a wall, one end of which tube fits into a pipe through which gas passes; and, to the other, a short bent end and elastic air-tight tube is fixed, two or three feet long, to which is also fixed a small bent tube, serving as the plug of a cock, and fitting into a hole in a piece of metal, and constituting the seat of the cock; the same being formed with an arm, through the end of which a screw is passed, the point of which rests upon the before-mentioned small bent tube, the said screw being employed to adjust the extent to which the opening in the cock is uncovered when out of use, or, if necessary, to close it entirely. A jet or small burner is fixed into the top of the cock-seat, and to the bottom thereof a handle is fixed. The action of the apparatus is as follows:—When out of use there will be but a small body of flame from the burner, but, upon lifting the cock up by the handle, the weight of the flexible tube will cause the small bent tube or plug of the cock to turn in its seat, thereby uncovering the opening therein, and increasing the volume of the flame, thus rendering it fit for use for lighting cigars, sealing parcels, and many other purposes, both commercial and domestic. Upon releasing the handle, the opening in the cock will necessarily be contracted, and the flame diminished, or, if necessary, extinguished, with unerring certainty and comparatively self-acting means as above described.

1924.—GEORGE BISH, of High Street, Stratford, Essex, engineer, and JAMES DREDGE, of 11, Adam Street, Adelphi, Middlesex, civil engineer, for "*Improvements in forming bends, and other forms or parts of non-metallic pipes, and in machinery or apparatus employed for such purposes, part of which improvements are applicable also to the formation of bends or curves in some kinds of metallic pipes.*" Provisional protection only obtained. Dated Aug. 3, 1861.

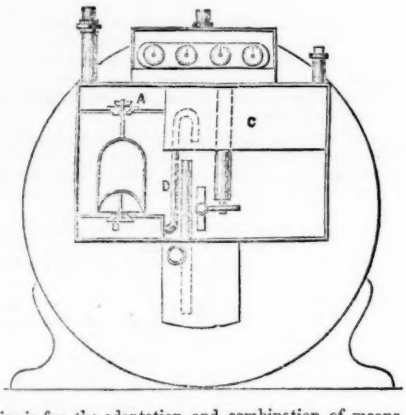
This invention consists, first, in the application of heat, either dry or moist, to pipes or tubes such as are manufactured from paper, canvass, linen, felt, and other non-metallic substances, for the purpose of rendering them sufficiently pliable to bend freely, and to be bent or moulded into any required form. Secondly, in a method of bending or curving such pipes or tubes by means of a series of rings, the width of each of which, in a line parallel with its axis, is greater at one side of the diameter thereof than at the other, so that when placed sufficiently in contact, they assume the form of the curve or bend required. Third, in the application of such rings to the bending of pipes formed of malleable metal. Fourth, in a method of making cast bends for pipes in non-metallic substances by moulding them on collapsible mandrills, capable of being easily withdrawn when the casting is set. Fifth, in a method of making up bends by wrapping strips of paper, linen, or other non-metallic substance, around collapsible mandrills, layer upon layer, until a sufficient thickness and strength are attained. Sixth, in a method of manufacturing branch and service-pipes of any description, such as T-pieces, &c., as follows:—An extra thickness or thicknesses of paper, linen, or other suitable material, is wrapped around the pipe where the joint is to be made, in order to give additional strength. A hole is then cut to admit the other pipe, which being inserted, a water-tight cement is placed around the junctions, and the whole is softened until the different parts are sufficiently adapted to, and incorporated with each other, when the joint is allowed to harden, and all internal projections are removed. Seventh, in a method of manufacturing socket-joints by stamping out the socket in the softened pipe, or otherwise, by working up the joint with an extra thickness of paper, linen, or other suitable material. Eighth, in constructing tubes intended to be bent or curved, with a thickness of material, gradually increasing from the side intended for the inner or smaller curve of the bend, to that intended to form the outer or larger

curve thereof; or, in other words, making the bore of the pipe eccentric to its outer diameter in such proportion, as that, when bent, the pipe shall be of equal strength throughout.

1912.—HENRY SHAW, of 40, Lower Ormond Quay, Dublin, printer, for "*Improvements in wet gas-meters.*" Patent dated Aug. 1, 1861.

The improvements relate to the application to the meter of a reservoir or tank for the supply of such additional water or other liquid as may from time to time become necessary to make up for that which may be lost by evaporation or otherwise. The communication through which such additional supply of water or other liquid passes to the meter is by means of a valve or pipe, which valve or pipe may be opened as the water in the meter is lowered; and, when the required supply from the reservoir or tank is admitted, such valve will shut. Within the meter is placed a float, to which is attached a valve fitting into a valve-seat of any suitable material —metal, wood, or caoutchouc. As the water in the meter is raised to its proper level, so will it float the valve to its shutting off any further supply than what may be necessary. Other means may be used, whereby the ordinary float used for regulating the gas-valve may be made to actuate a valve or pipe for admitting water from the water reservoir or tank, as by means of a balance-beam in connexion with the gas-float, which, as it falls, receives a stopper from out of the valve-seat fixed in the reservoir. A sandstone sponge is used; or, it may be, a syphon is placed over the opening in the tank, to prevent the possibility of any dirt or grit interfering with the perfect action of the valve or pipe for the supply of water.

The annexed drawing shows an ordinary gas-meter, with reservoir, C; float and valve, B; with syphon, D:—



The claim is for, the adaptation and combination of means for maintaining the water-level in gas-meters, as well as in ordinary tanks for domestic and commercial purposes.

1927.—GEORGE FOWLER JONES, architect, York, and JAMES JONES, architectural carver, York, for "*Improvements in apparatus for protecting and arranging water-pipes, and withdrawing water therefrom, and preventing injury thereto by frost.*" Patent dated Aug. 3, 1861.

These improvements relate, first, to supply-pipes. It being usually inconvenient or impracticable to place these sufficiently deep in the earth to be beyond the influence of frost, the same are protected by coating them with, or embedding them in, some one or other of the substances which are the slowest conductors of heat, such as felt, straw or haybands, india-rubber, fine dry sand or sawdust, clay, salt, or alum; and, when required, enclosing these in earthenware, or wooden pipes or casing. Just where the protection due to depth ceases, the supply-pipe is to terminate in a cylinder, placed horizontally or obliquely, having a piston, which, when pushed towards, and left at the outward limit of its stroke, shall permit a free passage of the water from the supply-pipe to the house-main; and, when drawn to its inward limit, and held so by a weight, shall stop and prevent the supply, at the same time permitting the water contained in the house-main, and branches, to return to the cylinder, and thence to run off by a waste-pipe into a drain, which waste, during the admission of the supply, is closed by the periphery of a second piston, opening longitudinally, and travelling simultaneously and commensurately with that first mentioned. In the case of hydrants, drinking fountains, pumps, or standards for the supply of railway-engines, sanitary water-closets, or other purposes, the cylinder above described is to be placed vertically, and sufficiently low in the ground for its contents to be below the action of frost, and the piston is to be rendered self-closing by means of a weight, spring, or other appliance—the water raised, and not required immediately, falling back for future use into the cylinder, or, in case of a pump, into the well, a considerable amount of water being thereby saved which is now wasted, while any stoppage from frost is prevented.

2nd. The supply-pipes branching from the street-mains are furnished with a tubular lining of india-rubber, closed at the end next the main, and fixed at both ends to the unions; and to this lining, and near to the supply stop-cock, another cock is provided, adapted for occasional connection with a small force-pump, by means of which air is to be forced in, and the pipe filled with compressed air, so as to obstruct the admission of water; or, in the event of the contained water having become frozen, to facilitate the thawing thereof by pumping in air or water at a high temperature, the elasticity of the india-rubber tubing previously allowing the expansion of the water by freezing, and thus preventing the bursting of the external metal pipe. Where hot-water pipes (excepting those of small diameter on the high pressure principle) are used for warming buildings, but only occasionally, an india-rubber pipe is to be inserted in them, extending throughout their length, and warmed as above in case of frost. This arrangement is also applicable for preventing gas-meters, and other cisterns, from bursting, and to thaw them if frozen.

The claims are for—

1. Shutting off water in surface-mains within the ground, and beyond the influence of frost, and emptying the pipe from the stop-valve to the discharge-pipe or tube, thereby preventing injury to it, or any stoppage by frost.

2. Shutting off, when desired, the water in surface-mains, by means of piston-valves, arranged in cylinders, at a sufficient depth under ground, so as to prevent any stoppage by frost. Also, in the case of vertical pipes, or standards for streets, or the supply of the tenders of locomotives, or other purposes, shutting off the water when desired, so that the water raised, and not discharged or used, will, when the supply is closed, fall into a reservoir or cylinder, at such a depth as to be beyond the influence of frost, or so that the cylinder may be cleared by allowing the water to run to waste, or into a reservoir, whence it may be repumped up into a cistern.

3. Arranging supply-pipes and house-mains that are usually exposed, so that they can be effectually protected or encased, to render the application of these piston-valves and appliances of general use in any situation. Also, the introduction of an india-rubber pipe, or pipe of similar elastic material, of slightly smaller bore, within a metal pipe, properly connected at the ends, so that either hot air, steam, or water, could be forced in between the india-rubber, or similar elastic material, and the metal, so as to thaw any ice, without risk of injuring the pipe by expansion of the frozen water that might have collected there, owing to the pipe remaining charged. This plan of introducing india-rubber tubing is also applied to prevent the bursting of pipes leading from, or passing through, cisterns, or other vessels for liquids, and affords a simple and ready means of thawing by forcing hot air, steam, or boiling water, between the pipes, or through the coils introduced into these vessels.

4. Emptying the vertical pipes, termed "pump-barrels," of water, above and below the bucket, into the well, below the reach of frost.

5. The method of opening and shutting the house supply to cisterns, and other receptacles, by self-acting arrangements, and emptying the same of water, as described.

1939.—HERMANN CHRISTIAN MEYER, of Hoxton, Middlesex, engineer, for "*Improvements in slide-valves to regulate or stop the flow of water, steam, or other fluid.*" Patent dated Aug. 5, 1861.

These improvements consist, firstly, of certain appliances to the ordinary slide-valves now in use, by means of which the friction on the face of the valve is reduced to a minimum. They consist, firstly, of eccentric axles, provided with wheels, placed on the sliding part of the valve, and revolving in bearings placed on each side of the wheel—the bearing-brackets or plummer-block being fixed on the pressure side of the slide-bearing, close to the wheels, in correspondence with rails fixed on the face side of the stationary frame of the valve. The axles are provided with levers so connected to the slide-rod that, by giving motion to the same, the eccentric axles make a quarter turn, and so raise the body of the moving slide, causing it to bear on the wheels, and on the rails provided in the stationary frame of the valve. By these means, the pressure is taken from the face, and transferred to the wheels and axles; thus reducing the power required to open the valve. Instead of the eccentric axles above described, common axles and eccentric bearings may be used, as those will have the same effect.

2. In the second arrangement, the axles are not eccentric as in the first plan, but will be fixed on to the body of the slide-valve, and the wheels will revolve in one and the same position on the rails of the stationary frame of the valve. To form the joint, the faces are adapted as now to be described:—first, the faces are fixed stationary on to the slide-valve as usual; second, on the face side is formed a frame corresponding with the opening in the stationary frame of the valve, the faces to be loose, but grooved so as to fit the said frame. On the face side of the slide, and under the said face, to be placed a fitting thickness of india-rubber, or other elastic substance, forming a double face-joint; and, third, on the face side of the slide is formed a frame corresponding with the opening in the frame of the valve. The said frame on the slide is shaped to an angle, the degrees of which are regulated according to the pressure required to form a joint; the loose faces fit the angle of the frame on the slide, and are flat on the side which is towards the face of the stationary frame of the valve. On the outer side, the pressure of the fluid is to act so as to force the loose faces towards the angle-shaped frame on the slide, and towards the faces on the stationary frame of the valve, thus forming a double joint—the pressure on the slide being on the wheels and rails; and thus the only friction is from the pressure on the outer surfaces of the loose faces. The number of pieces to form the loose faces depends upon the form of the opening in the stationary frame of the valve. This plan, as well as that secondly described, is useful for rotary motion as well as for a sliding motion.

The claim is for—

1. The use of eccentric axles or eccentric bearings, with wheels and rails.

2. The adoption of stationary axles of ordinary character, with wheels and rods, forming a double joint on the slide, and on the frame of the valve.

3. Elastic packing-face double joint.

4. Metallic double-joint face.

APPLICATIONS FOR LETTERS PATENT.

324.—PETER SHAW, of Edinburgh, gentleman, for "*Improvements in lamps.*" Feb. 7, 1862.

366.—JOHN ROBB, of Aberdeen, N.B., merchant, for "*Improvements in ventilating.*" Feb. 12, 1862.

376.—JOHN STEPHEN JOSEPH, of Rhostyllan, near Wrexham, Denbigh, North Wales, for "*A retort-oven, and the utilization of the spare heat from the same.*" Feb. 13, 1862.

378.—MARC ANTOINE FRANÇOIS MENNONS, of Paris, for "*Improvements in the disinfection of animal excretions, and in the extraction therefrom of fertilizing elements for agricultural purposes.*" A communication. Feb. 13, 1862.

385.—Francis Falconer, of Glasgow, N.B., warehouseman, for "*Improvements in lamps.*" Feb. 13, 1862.

403.—Thomas Renison, of Glasgow, N.B., plumber, for "*Improvements in water-closets.*" Feb. 15, 1862.

407.—Joseph Wall, plumber, and Thomas Dodd, glass merchant, both of Liverpool, for "*Improvements in the construction and arrangement of apparatus for regulating the flow or passage of fluids.*" Feb. 15, 1862.

418.—Francis William Gerish, of East Road, City Road, London, engineer, for "*Improvements in pumps.*" Feb. 15, 1862.

423.—Edward Thomas Hughes, patent agent, 123, Chancery Lane, London, for "*An improved method of, and apparatus for, collecting the gases given off from furnaces.*" A communication. Feb. 17, 1862.

431.—William Clark, of 53, Chancery Lane, London, engineer and patent agent, for "*Improvements in gas apparatus used for lighting cigars, and other tobacco.*" A communication. Feb. 18, 1862.

439.—Frederick Barnett, 230, Oxford Street, London, for "*An improved lamp or lantern for street lighting, and other purposes.*" Feb. 19, 1862.

444.—William Davies, of Spencer Road, Stoke Newington, London, oil refiner, for "*Improvements in increasing the illuminating effect of coal-gas, and other gases.*" Feb. 19, 1862.

GRANTS OF PROVISIONAL PROTECTION.

113.—William Cleland, of St. George's Hill, Everton, Liverpool, for "*Improvements in treating and utilizing certain materials used, and products obtained in the manufacture of gas, and in apparatus connected with the said treatment.*" Jan. 15, 1862.

136.—William Tice, of 16, Downham Road, Islington, London, for "*Improvements in gas-regulators and meters, part of which invention is also applicable for covering various descriptions of metal spindles.*" Jan. 18, 1862.

226.—William Edward Newton, of 66, Chancery Lane, London, civil engineer, for "*Improvements in engines to be employed by pumping or forcing air or water, or for other purposes where a rectilinear motion is required.*" A communication. Jan. 28, 1862.

261.—John Hargreaves, of 12, Clifton Cottages, Clifton Road, Peckham, for "*Improvements in the manufacture of pipes or tubes for conveying water, gas, acids, sewage, enclosing electric telegraph wires, and for other purposes, which improvements are also applicable to the manufacture of other vessels and articles, and in the machinery or apparatus connected therewith.*" Jan. 31, 1862.

263.—Charles Pontifex, jun., of 55, Shoe Lane, London, for "*Improvements in apparatus for cooling or heating fluids or liquids.*" Jan. 31, 1862.

270.—Leon Fauvel, of Paris, manufacturer, for "*Improvements in apparatus for indicating the existence of escapes in gas-tubing, and for stopping the continuance thereof.*" Feb. 1, 1862.

290.—George Manwaring, of Southampton, engineer, for "*Improvements in flushing apparatus for closets, sewers, and other water-services.*" Feb. 4, 1862.

297.—James Webster, of Birmingham, engineer, for "*Improvements in gas-fittings.*" Feb. 4, 1862.

299.—Daniel Gallafent, of 15, Stepney Causeway, London, for "*Certain improvements in the mode or modes of generating or producing elastic vapours to be used as a motive power.*" Feb. 5, 1862.

316.—Michael Henry, of 84, Fleet Street, London, for "*Improvements in obtaining and applying motive power, and raising and forcing fluids, and in apparatus employed therein.*" A communication. Feb. 6, 1862.

324.—Peter Shaw, of Edinburgh, gentleman, for "*Improvements in lamps.*" Feb. 7, 1862.

NOTICES TO PROCEED.

2455.—James Davis, iron-master, and Thomas Evans, engine-fitter, both of Ulverstone, for "*Improvements in the construction of engines to be worked by steam, air, or gases.*" Oct. 2, 1861.

2473.—William Malam, of Skinner Street, London, gas engineer, for "*Improvements in apparatus for the manufacture of gas.*" Oct. 3, 1861.

2516.—William Smith, of 21, King Street, Smithfield, London, gas-meter manufacturer, for "*Improvements in apparatus for measuring and regulating the pressure of gas.*" Oct. 9, 1861.

2567.—William Ross, of Glasgow, N.B., brassfounder, for "*Improvements in constructing taps or valves.*" Oct. 15, 1861.

2727.—James Lee Norton, of Belle Sauvage Yard, Ludgate Hill, London, for "*Improvements in apparatus for raising water.*" A communication. Oct. 30, 1861.

3184.—Joseph Henry George Wells, of 2, Sandhurst Villas, Binfield Road, Stockwell, Surrey, civil engineer, for "*Improvements in the method of, and apparatus for, pumping elastic fluids.*" Dec. 19, 1861.

61.—John Brunt, of 15, Rue Petrelle, Paris, engineer, for "*Improvements in gas-meters.*" Jan. 9, 1862.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2225.—Charles Baylis, "*An improved mode of constructing and arranging underground chambers in populous cities or towns, for the reception of gas and water-pipes, and telegraph-wires.*" Oct. 6, 1858.

2272.—William Johnston and William Ross, "*Improvements in water-closets, and taps or valves.*" Oct. 12, 1858.

2301.—William Bacon, "*Improvements in the mode of constructing valves, valve-cocks, gates, and stop-cocks, which may be used in steam engineering, and for other purposes.*" Oct. 15, 1858.

2312.—Joseph Pierre Gillard, "*Improvements in generating hydrogen, and in the means of, and apparatus for, applying the same to lighting and heating purposes.*" Oct. 16, 1858.

2368.—Edward Clarence Shepard, "*Improvements in electric lamps.*" Oct. 23, 1858.

2372.—William Edward Newton, "*Improvements in pumps.*" Oct. 23, 1858.

2487.—Wilhelm Ziervogel, "*Improvements in apparatus for distilling products from bituminous coal, schist, peat, and other like substances.*" Nov. 6, 1858.

2491.—John Richmond, Joseph Quick, jun., and Alexander Fraser, "*Construction of a meter for measuring water, spirits, or any other fluids.*" Nov. 8, 1858.

2527.—Charles Tiot Judkins, "*Improvements in gas-regulators.*" Nov. 10, 1858.

2546.—William Ashton and Thomas Cartmell, "*Improvements in air-pumps, part of which improvements is also applicable to the pistons of other pumps, and of steam-engines.*" Nov. 13, 1858.

2632.—James Wadsworth, "*Improvements in gas-burners, and in the means or methods of, and in apparatus for, moderating or retarding, regulating, or governing the flow and pressure of gas used for the purposes of illumination and in street lamps, or lanterns for shielding flame from the action of wind and rain.*" Nov. 20, 1858.

2636.—Charles Tomlinson, "*Improvements in stop-taps, or valves.*" Nov. 20, 1858.

2648.—Robert Nelson, "*Improvements in apparatus for raising and lifting water and other liquids.*" Nov. 22, 1858.

2669.—James Lyson Nibbs, "*Improvements in lighting, heating, and ventilating.*" Nov. 24, 1858.

2680.—Frederick Loos, "*Improvements in gas-regulators.*" Nov. 25, 1858.

2685.—Edwin Dixon and John Fisher, "*An improvement in the manufacture of welded iron tubes.*" Nov. 26, 1858.

2723.—Daniel Evans and George Jones, "*Improvements in pumps and water-gauges.*" Nov. 29, 1858.

2739.—Thomas Paramore Purssglove, "*An improved pressure-gauge for steam, gas, or other fluids.*" Dec. 1, 1858.

2740.—Richard Laming, "*Improvements in purifying gas, and in turning sulphuretted hydrogen, carbonic acid, and ammonia, or their compounds to profitable account.*" Dec. 1, 1858.

2745.—Frederick Warner, John Derbyshire and Alexander Mann, "*An Improvement in the manufacture of cocks or taps.*" Dec. 1, 1858.

2764.—George Edward Noone, "*Certain improvements in machinery for generating gas from coal.*" Dec. 3, 1858.

2776.—Edouard Aristide Servier, "*Improvements in pressure and fluid-level indicators.*" Dec. 4, 1858.

2797.—James Edward Boyd, "*Improvements in the construction of taps, valves, cocks, spigots, or other apparatus or instruments for gauging or for drawing off the liquid or fluid contents of any cask, butt, vat, barrel, or other vessel.*" Dec. 7, 1858.

2806.—William Burness, "*Improvements in pumping and forcing liquids.*" Dec. 7, 1858.

2820.—John Barrow, jun., "*Improvements in the treatment of coal-gas tar, and of the oils obtained by the distillation of the same, and for the application of substances obtained thereby.*" Dec. 9, 1858.

2843.—Stephen Dudgeon, "*An improved gas-regulator.*" Dec. 11, 1858.

2860.—Ebenezer Bow, "*Improvements in pumps.*" Dec. 14, 1858.

2902.—James Taylor, "*Improvements in the construction of pumps or engines, for lifting and discharging water.*" Dec. 18, 1858.

2936.—John Whitelaw, "*Improvements in sewerage and drainage apparatus.*" Dec. 23, 1858.

2952.—William Beckett Johnson, "*Improvements in the employment of gas for generating steam, and in engines connected therewith.*" Dec. 24, 1858.

2960.—John Davies, "*An improved portable self-gas-generating lamp.*" Dec. 27, 1858.

2987.—Thomas Bell, "*Improvements in purifying gas.*" Dec 30, 1858.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2126.—Thomas Cooper, "*An improvement in the manufacture, and in the mode of joining earthen pipes.*" Oct. 3, 1854.

2191.—Charles Frederick Stansbury, "*Improved apparatus for heating buildings.*" Oct. 13, 1854.

2361.—George Davis, "*Improvements in taps or cocks.*" Nov. 8, 1854.

2585.—John Thom, "*Improvements in apparatus for singeing or firing cotton, or other fabrics.*" Dec. 9, 1854.

2593.—Edward Manière, "*Improvements in lamps.*" Dec. 9, 1854.

Parliamentary Intelligence.

HOUSE OF LORDS.

TUESDAY, FEB. 11, 1862.

The BRISTOL WATER, EAST LONDON WATER, FALMOUTH WATER, KENT WATER, LEEDS NEW GAS, LEEDS WATER, READING and READING UNION GAS, WAKEFIELD WATER, WINDERMERE DISTRICT GAS, and WOOLWICH, PLUMSTEAD, AND CHARLTON GAS Bills, were read a first time, and referred to the Examiners.

THURSDAY, FEB. 13.

The CATERHAM WATER-WORKS, DUNDEE WATER, and STRETFORD GAS Bills, were read a first time, and referred to the Examiners.

MONDAY, FEB. 17.

A petition was presented against the BRISTOL WATER Bill, from the corporation of Bristol.

THURSDAY, FEB. 20.

The BRISTOL WATER, EAST LONDON WATER, FALMOUTH WATER, KENT WATER, LEEDS NEW GAS, READING AND READING UNION GAS, WINDERMERE DISTRICT GAS, and WOOLWICH, PLUMSTEAD, AND CHARLTON GAS Bills, were read a second time.

FRIDAY, FEB. 21.

The DUNDEE WATER, WAKEFIELD WATER, and STRETFORD GAS Bills, were read a second time.

HOUSE OF COMMONS.

MONDAY, FEB. 10, 1862.

The Examiner reported, that the Standing Orders applicable to the GREAT CENTRAL GAS CONSUMERS and the WREXHAM WATER Bills had not been complied with. Referred to the Select Committee on Standing Orders.

The HECKMONDWIKE GAS, SALFORD IMPROVEMENT, HALIFAX CORPORATION, and BOLLINGTON (PRESTBURY) IMPROVEMENT AND LIGHTING Bills, were read a first time, and ordered to be read a second time.

The PAROCHIAL ASSESSMENTS Bill was read a first time, and ordered to be read a second time.

TUESDAY, FEB. 11.

The BRADFORD CORPORATION WATER, KENT COUNTY GAOL AND LUNATIC ASYLUM (WATER SUPPLY), BARNSLEY LOCAL BOARD OF HEALTH, and METROPOLIS LOCAL MANAGEMENT ACT AMENDMENT Bills, were read a first time, and ordered to be read a second time.

WEDNESDAY, FEB. 12.

The NOTTINGHAM WATER, METROPOLIS GAS, and LIVERPOOL CORPORATION WATER Bills were read a first time, and ordered to be read a second time.

THURSDAY, FEB. 13.

The ABERDEEN POLICE, WATER, &c., Bill, was read a first time, and ordered to be read a second time.

FRIDAY, FEB. 14.

The HIGHWAYS BILL.—Order for second reading read; motion made, and question proposed, "That the Bill be now read a second time:"—Amendment proposed, to leave out the word "now," and at the end of the question to add the words "upon this day six months" (Mr. Barrow). Question put, "That the word 'now' stand part of the question:"—The House divided, Ayes 141, Noes 30:—Main question put and agreed to:—Bill read the second time, and committed to a select committee.

MONDAY, FEB. 17.

The BARNSLEY LOCAL BOARD OF HEALTH, BOLLINGTON (PRESTBURY) IMPROVEMENT AND LIGHTING, BRADFORD CORPORATION WATER, HALIFAX CORPORATION, and HECKMONDWIKE GAS Bills, were read a second time, and committed.

The PAROCHIAL ASSESSMENTS Bill was read a second time, and committed to a select committee.

SEWAGE OF TOWNS.—Mr. BRADY rose to move for a select committee, to inquire into the best means of utilizing the sewage of the cities and towns of England, with a view to the reduction of local taxation, and the benefit of agriculture. His object, he said, was to determine whether the sewage of our towns was a valuable commodity, to ascertain the best and cheapest means of applying it to the land, and whether there were any engineering difficulties in the way. No more important subject could occupy the attention of the House, for the most fearful results had followed from the neglect of the sewage question. Death, lurking stealthily in alleys, and courts, and cesspools, lay in wait to remove strong, healthy men, from the scenes of this life. He regarded the main drainage scheme with sanguine anticipation; for, if it succeeded, London would be rendered one of the healthiest cities in the world, and the other towns throughout the country would imitate its example. For a time, the energy of the country had been paralyzed, owing to the fact that a report had been sent to the metropolitan commissioners, by a Mr. Wickstead, to the effect that it was an engineering and commercial impossibility to utilize sewage in a fluid state, and that the principle of solidification would need to be employed. But it turned out afterwards that this Mr. Wickstead was the patentee of a process of solidification, and had a company actually established for the purpose at the time. Under the belief that water was one of the best deodorizers in the world, and that the rivers of the country were the natural outfalls for sewage, all the streams had been polluted; in many cases, with fatal results. At Brighton, where, if properly applied, it could be of immense advantage, sewage to the value of thousands of pounds was annually wasted. All scientific men who had investigated the subject admitted its valuable properties as manure, but were not agreed with regard to its pecuniary value. The honourable member quoted the estimates of seven gentlemen as to the value of the sewage of the country: the lowest was £7,054,365; and the highest, £93,283,000 a year. They were all men who had devoted much time and attention to the subject; and the great discrepancy between their estimates proved the necessity of further inquiry. The present exhaustive system of agriculture required an immense supply of artificial manure; and it was feared that guano would not last more than twenty years, at the present rate of consumption. The honourable gentleman quoted a speech of Lord Palmerston at the Lewes Agricultural Meeting in 1852, in which the noble lord said, "He could not but think that the progress of chemical science and the application of that science to agriculture, would lead to something that would render the farmers less solicitous about guano, and give them a reproductive substance nearly as good, to be obtained, not from the other side of the world, but at their own doors." He concluded by moving the appointment of a committee.

Mr. P. URQUHART seconded the motion.

Mr. COWPER said that the utilization of sewage for the purposes of agriculture had long been a problem studied by all persons interested in the sanitary improvements of towns. The late Board of Health instituted inquiries, and made many valuable reports upon the subject. Hitherto, little progress had been made in solving the difficulty; for, although the sewage in small towns, under special circumstances, could be advantageously applied to agriculture—as in the cases of Rugby and Watford—engineering skill had at present failed in finding a scheme entirely satisfactory in the case of large cities. He was not sanguine that the inquiries of the committee would lead to any great advance in this branch of sanitary knowledge. But, as the honourable member was willing to undertake the inquiry, and had shown good reasons for it, no objection would be made to the appointment of the committee; and he hoped some additional light would be thrown upon such an important subject.

The motion was then agreed to.

The HIGHWAYS Bill was referred to a select committee, consisting of Sir George Grey, Mr. Henley, Mr. Walter, Mr. Hardy, Sir William Jolliffe, Mr. Dodson, Sir Baldwin Leighton, Mr. Bruce, Mr. Algernon Egerton, Mr. Buller, Sir Matthew White Ridley, Mr. Thompson, Mr. Howes, Mr. Wm. Forster, and Col. Barttelot. Five to be a quorum.

TUESDAY, FEB. 18.

The ABERDEEN POLICE, WATER, &c., Bill, was read a second time, and committed.

THURSDAY, FEB. 20.

The LIVERPOOL CORPORATION WATER and NOTTINGHAM WATER Bills were read a second time, and committed.

A petition was presented against the PAROCHIAL ASSESSMENTS Bill, from the Manchester overseers.

A petition was presented against the BARNSLEY LOCAL BOARD OF HEALTH Bill, from James Hobson Farrar and others.

FRIDAY, FEB. 21.

The HECKMONDWIKE GAS, BARNSLEY LOCAL BOARD OF HEALTH, NOTTINGHAM WATER, BRADFORD CORPORATION WATER, and WREXHAM WATER Bills, were referred to a select committee, consisting of Mr. W. O. Stanley, Mr. Hanbury, Mr. R. Hodgson, Mr. St. Aubyn, and Mr. Rogers, who will sit on Tuesday, March 4, at twelve o'clock.

Legal Intelligence.

VICE-CHANCELLOR'S COURT.

FRIDAY, FEB. 7.

(*Before Vice-Chancellor* WOOD.)

HILLS *v.* THE LIVERPOOL UNITED GASLIGHT COMPANY.

Mr. ROLT, Mr. GROVE, and Mr. MARTEN, in this case moved for an injunction to restrain the defendants from manufacturing and purifying gas according to, or in imitation of the invention comprised in the plaintiff's patent of the 28th of November, 1849, as modified by the disclaimer and memorandum of alterations; and, also, from using or selling gas manufactured and purified as aforesaid; and, also, renovated and reoxidized purifying materials, according to or in imitation of the same invention; and, generally from infringing the plaintiff's patent.

It appeared from the statement of the learned counsel for the plaintiff, that the material used by the defendants for the purification of the gas, was a substance called "bog-ochre;" the use of which, as the plaintiff contended, was an infringement of his patent. The arguments were generally a repetition of those advanced for the plaintiff in *Hills v. Evans*, which, having been reported at great length in the last two numbers of this JOURNAL, it is unnecessary to repeat them here.

At the conclusion of the arguments for the plaintiff, the motion was adjourned till Monday.

MONDAY, FEB. 10.

Sir HUGH CAIRNS (Mr. DRUCE with him) appeared for the defendants, and argued that the patent in question had been supported, and its validity determined upon one ground only. There was one thing that had saved it, and if not saved by that, the patent was worth nothing. It had been determined—first, by the Court of Exchequer, then, by His Honour, following the Court of Exchequer, and, ultimately, by the Lord Chancellor—that Hills' patent did not extend to natural oxides; but, extended to, included and referred to artificial oxides only. The words were so limited and so guarded, that, as the Lord Chancellor said again and again, they pointed to the processes of the laboratory only, and not to the acts of nature. That was the determination in opposition to an argument on the part of the defendant, Evans, that the patent went further, and claimed the natural oxides, and, that therefore it was too large. Had the defendant been right in his construction, the patent would doubtless have been found to be entirely invalid. It was held, however, that the patent had, with sufficient care, limited itself to artificial oxides. Having thus supported his patent, Mr. Hills was doing what many people had done before—he was pursuing his victory too far, and was now desiring to extend his patent in the way which the court held it ought not to be extended, and was proceeding against persons who, confessedly were using a natural oxide. Now, Dr. Miller and Dr. Taylor had sworn that the oxide in question was a natural oxide, but they had sworn positively that it was precipitated.

The VICE-CHANCELLOR: The question before me is, whether you ever find in nature that which is a precipitated oxide?

Sir HUGH CAIRNS continued: Those gentlemen admitted it was done by nature, but it was precipitated, whereas, in their evidence in *Hills v. Evans*, at the trial, they had said that there was no precipitated oxide in nature. Their statement was now, that bog-ochre was a natural oxide, but precipi-

tated. He (Sir Hugh Cairns) contended that, according to the judgment of the Lord Chancellor in *Hills v. Evans*, all that was claimed under the plaintiff's patent was an artificial hydrated oxide; and, if the oxide might be described by the term "precipitated," still it must be an oxide precipitated by artificial means; and that if it was to be found precipitated in its natural state, it would not be within the patent. The persons who came forward to give evidence in support of the patent, said there were several things known as natural precipitated oxides, as, for instance, brown hematite or ore in a solid form; they were asked whether the ore would require artificial preparation, and they said it would: but, they did not say, as to all natural substances, that they would require artificial preparation before they could be used. It was confessed that the defendants used natural oxides, and if nature as the first exemplar in producing a natural oxide, at the same time precipitated it, Mr. Hills did not claim that. Therefore, on the first part of the case, the defendants were clear of the patent. As to the renovation, unless the plaintiff was entitled to strike out the whole of the first part of the specification, the case of the plaintiff was not open to argument. The second claim in the specification was—"Repeatedly renovating or reoxidizing the said purifying materials by the action of the air, whenever they from time to time cease to absorb sulphuretted hydrogen." Using, in the first instance, what he (Sir Hugh Cairns) contended the defendants were entitled to use, and it ceasing after a time to produce the desired effect, when it was exposed to the air, it was brought back to its original state. What was that? The state of its being a natural, and not an artificial purifier; and, in that view of the case, also, it would be entirely out of the plaintiff's patent; because the purifying materials claimed by Mr. Hills were renovated artificial oxides.

Mr. DRUCE followed on the same side. The first question, he said, was whether the plaintiff himself, as a scientific man, having regard to the nature of his patent, contemplated the use of a native oxide under it? The patent in this respect was peculiar. It was not the invention of a thing never heard of before; but an invention in its practical application, limited to a particular class of subjects, and the patentee did not assert that he had ever experimented upon or thought of the particular subject matter, which he was now endeavouring to bring within the scope of his patent. The two witnesses, Doctor Taylor, and Doctor Miller, whom the plaintiff brought forward at the trial, both stated that a precipitated oxide could not properly be termed a native oxide; and the patent itself was confined simply to artificial oxides. Nowhere in the specification did the patentee mention the use of native oxides; no doubt, he used the words "from whatever source obtained"; and the defendant before the Lord Chancellor, in *Hills v. Evans*, argued that those words might indicate a hydrated oxide obtained from a natural source; but the decision was against him. Again, the plaintiff said he used it in a damp state, and that could only be referrable to a precipitate prepared in a damp state. The plaintiff also recommended his oxide to be used mixed with sawdust or breeze, so as to make the material used porous; and, if applied to an artificial or prepared oxide, of course it was useful for distending or keeping apart the grains, so as to enable the gas more freely to penetrate. But, when you dealt with an ochre or bog earth, an oxide in connexion with a fibrous woody substance, then you would materially impair its purifying influence if you used it mixed with a foreign substance. And so, upon every occasion when the validity of the plaintiff's patent had been the subject of litigation, the decision went upon the ground of its being confined to artificial oxides. Doctor Miller and Doctor Taylor, although they had sworn the other way before, now said they were prepared to state that the particular thing used by the defendants was formed by a process of precipitation; and the only way in which they attempted to prove it was by a process of analogy. Now, he (Mr. Druce) contended that it would be most unsafe to proceed upon analogy in such a case, because, he believed, there were no matters upon which men of science differed more widely than upon matters appertaining to geology, or the mode in which the different natural geological formations came to be formed. Was it possible for any person to predict of the thing used by the defendants, that it was within the class of things claimed by the plaintiff without making experiments? If not, then the plaintiff's patent was open to the vice that he had not shown within definite limits the things which he claimed.

The VICE-CHANCELLOR: Suppose you discovered nature performing the exact process of the laboratory, so that this iron was to be seen being precipitated, would it then be within the plaintiff's patent?

Mr. DRUCE would submit not; but the defendant's case was that it was impossible to adduce evidence to prove distinctly the way in which the thing used by them was formed. The only way in which the matter could be approached at all was by a process of experiments, and that was the plan which the plaintiff had adopted: and, according to the judgment of the Lord Chancellor, it followed that Hills could not claim it, because the Lord Chancellor expressly said that the information given by the patent must be such as to render unnecessary any further experiment. Then, as to the second claim of the plaintiff—namely, the renovation of the "said materials," the defendants contended it was absolutely necessary that those "said materials" should be confined to the limited class which the plaintiff claimed in the first branch of his patent; and, in describing the process of renovation, Mr. Hills said it was a process which was brought to bear upon the sulphuret of iron, which had been formed by a process of using an artificially prepared hydrated oxide of iron; and he cautiously limited himself to the use of the "said materials." It was not attempted to be denied that other people knew there were such natural properties in air or oxygen that it would discharge the sulphur, and renovate the material: but you could not take out a patent for a natural agency. The Court of Exchequer held that that was so; but they said it was the subject of a patent when taken in connexion with the plaintiff's process of purifying gas; and, upon these grounds, the learned counsel contended that the plaintiff was not entitled to the injunction which he prayed.

Mr. GROVE, in reply, said, the first branch of the argument for the defendants rested upon expressions in the judgments of the Court of Exchequer, His Honour, and the Lord Chancellor; and, if it had been necessary for those judgments in deciding the point to use the expressions in reference to which had been so much relied upon—then, possibly, the matter might be said to be *res judicata*, but, in truth, the passages relied upon were only *obiter dicta*, because the judgments could have been given without using the word "artificial" at all. But admitting all those *dicta*, the plaintiff by no means conceded that the patent would be invalid, for this reason: it did not follow, because a specification had used words which might comprehend something which would not succeed, that the patent was, therefore void, unless it be so obviously calculated to mislead, so inevitably likely to induce people into error, that the expressions would not be a proper description of the patent. He would assume it had been previously known that precipitated hydrated oxides would absorb sulphuret of hydrogen, and form sulphurets; but that was only known *alio intuitu*, and not at all in connexion with the purification of gas. If, after Mr. Hills discovered that the hydrated precipitated oxide would not only absorb sulphuretted hydrogen, but would abstract it from a compound of many materials, it would have been manifest to any chemist that it would have been idle and useless to employ the native rocks—for half the rocks in the world had more or less of oxide of iron in them, and a great many consisted almost entirely of it—the specification would not then have been bad; and, therefore, if the Court of Exchequer had adopted the disjunctive sense of the word "or," in the words "precipitated or hydrated," the specification would not then have been bad, because they would have said he means such hydrates as could be known by chemists to have a sufficient affinity for sulphur. The Court of Exchequer said, the processes, as given by Mr. Hills (which he did not claim), were artificial processes; and, it therefore followed, that what he meant were artificial hydrates; but, they used that word in a sense contradistinguished from what were then called native hydrates, which, it was admitted, would not do. Was it because, for a convenient form of expression, the word "artificial" was used, in contradistinction to the native oxide, that therefore Mr. Hills was to be tied down to that which he himself had not used at all, but had carefully excluded by the use of the words "from whatever source obtained?" It was not as if there were classes of chemical substances in a chemical laboratory, which ran by insensible degrees into another—some of which would do, and some would not—because the distinction between the precipitated oxides and the native rocks was so broad that no chemist would think of taking the stones and applying them to gas. The Court of Exchequer, in their judgment, used the term hydrated oxides, which were also precipitate; but then they said, "that is to say, 'artificial,'" which word had been used in argument to distinguish them from artificial; and throughout they used the terms "precipitated" and "artificial" as almost synonymous. So anxious was Mr. Hills not to claim the mode of making the thing itself as a result, but merely the application of the thing to the purification of gas, that he disclaimed the mode of making it. Knowing that his discovery was not the mode of obtaining the hydrated oxides, but their application, he said, "You may make oxides as you please; you may make your sulphurets as you please, and make your oxides from them; I do not claim that, but I claim the application of precipitated oxides when applied to the purification of gas." Mr. Hills said: "A convenient mode by which you may make the hydrated oxide of iron, is by taking hydrosulphate of ammonia, which you have in gas liquor; mix with it sulphate or muriate of iron—you then form a sulphuret of iron; then expose that to the air, and you will revivify it." Therefore, did not the defendants do the identical artificial thing which Mr. Hills described in his patent? They took a sulphuret, the preparation of which Mr. Hills did not, in any sense, claim, whether natural or artificial; and they used it precisely in the same way.

The VICE-CHANCELLOR: The second time of using; it became Hills' first.

Mr. GROVE: Yes; without a distinction. It was artificial sulphuret, formed in the same way, and used in the same way. Now, it was said that Mr. Hills had not experimented upon native oxides. If he had not experimented upon the native rocks, why had he used the word "precipitated" so perseveringly throughout his specification? In nearly every page of the specification, Mr. Hills used the words, "hydrated and precipitated oxides."

The VICE-CHANCELLOR: The Lord Chancellor treated the two as distinct. He says he prefers doing that to taking the view of the Exchequer.

Mr. GROVE: His lordship did not, by that means, exclude the word "hydrated."

The VICE-CHANCELLOR: But he gives to hydrated the sense of artificial.

Mr. GROVE would rather say to precipitated, the sense of artificial. What apparently was in the mind of the Lord Chancellor was this: had Mr. Hills by his specification, by using the word "hydrated," used too wide a term, and set the public on using that which he must have known would not do? He had not, because, by coupling it with the word "precipitated," he had shown to the public that what he meant was an artificial precipitate. No doubt, the Lord Chancellor went that length. But, had Mr. Hills indicated anything which would lead the public into error? Certainly not; and, therefore, the patent was not bad. A specification was bad, if it pointed out to the public that which would not do; but, it was not bad, because it did not point out to the public all that would do. Could it alter the essence of Mr. Hills' invention; could it alter an infringement, that parties got their material from bogs, and Mr. Hills got his from the laboratory? Suppose a man had very large works, and outside he had a pond for his refuse water, with a large quantity of iron filings, which became oxidated by exposure to air and water, and formed, at the bottom of the pond, a large deposit of hydrated precipitated oxide of iron—could it be said that using that for the purpose of gas manufacture was not an infringement of Mr. Hills' patent, because nature, by the action of the air and water outside the works, formed the precipitate? While, on the other hand, a man who had done the same thing by blowing air through the water, and oxidating the iron, would infringe a patent which claimed neither process, but which claimed the use of a product in a particular way. Was there any art, which, if you searched the world, you would not find nature imitate? Mr. Hills not only claimed the revivification, but he claimed the chemical process which took place by the revivification; and, therefore, it was clear that the defendants were guilty of infringement, and ought to be restrained by injunction.

The VICE-CHANCELLOR: I will dispose of this on Friday.

FRIDAY, FEB. 14.

The VICE-CHANCELLOR, in delivering judgment, said: This case comes before me in its present shape upon an interlocutory motion for an injunction to restrain the defendants, the Liverpool United Gas Company, from proceeding to purify gas in a manner which is described in the bill, which I shall, hereafter, more particularly refer to, as being an infringement of the patent secured to the plaintiff, Mr. Hills. I say "secured" now, because the late judgment of the Lord Chancellor, which, of course, would conclude me, under any circumstances, has decided the point as to the validity of the patent, and it is not contended, on the part of the defendants, that the validity of the patent can now be called in question. Although the matter has been long discussed, and some three or four words of the plaintiff's patent have occasioned three or four weeks, I believe, of discussion in this and other courts, yet the question shortly is, whether or not the particular substance which has been used by the defendants is a substance, the use of which constitutes an infringement of the mode of purification described in the patent of the plaintiff. Now, I will state the matter first in this way. Assuming it, in the first instance, to be what may be called a natural precipitate of iron (I shall have to consider the question whether it is a precipitate or not), that is to say, a precipitate of iron not elaborated in the laboratory, but elaborated by some great laws which the Supreme Intelligence has implanted upon these material sub-

stances, then the question is, whether or not, in that state of circumstances, it be an infringement of the patent which describes the process of purification of the plaintiff to be a process of "purifying coal-gas by passing it through the precipitated or hydrated oxides of iron?" Those are the only words upon which the question now turns, and he uses these words further—"By passing it through precipitated or hydrated oxides of iron, or the subsulphates or oxychlorides of iron from whatever source obtained." Those words are, of course, of some importance. Now, if it be as I, for the present hypothesis, have assumed it for the moment to be, precipitated, though found in what is called a natural state; if it be, I say, a precipitate of iron, according to the ordinary reading of these words, "precipitated or hydrated oxides of iron, or the subsulphates or oxychlorides of iron from whatever source obtained," one would suppose that there was no longer any doubt upon the question. But great doubt is thrown upon it in consequence of what has passed on the previous analyses of this patent, and the doubt arises in a manner which is in no way apparent to an unscientific mind upon the first reading of the specification, but it arises upon the question, whether or not under the words, "precipitated or hydrated oxides of iron," if you give to the words, "hydrated oxides of iron," or to the words "precipitated oxides of iron," so large a generality as to include the native oxides as they may be termed in a certain sense, though, perhaps, not altogether a correct sense; but, those oxides which are formed without the art of man having been used in producing them, then you arrive at a class of oxides, which existing in rock or in forms of that description, and not being precipitated or not known in our present state of knowledge, at all events presenting no appearance of being precipitated, the question is, whether they are or are not oxides capable of being used in this process of purification? It is admitted on all hands that there are certain hydrates of iron found in a rocky state in nature, which, when used, will not produce this process of purification of gas. Therefore, if you have described (and that is, elaborately gone through in the Lord Chancellor's judgment in his analysis of the other patents which then had to be compared) in your process in terms too general the material which you use for the purpose of producing the effect desired, then, inasmuch as an ordinary workman might be misled into the use of substances which would prove to be wholly useless, you have misdirected those who by your specification ought to have full and precise information of the means by which they were to attain the desired result; and, having so misled them, your patent is void on that account. Now, it is admitted here that the validity of this patent has been established; but it was thus argued—it has been established on the very ground that by the words "hydrated oxides" you did not in truth include anything but artificial oxides; and, although you have used the words "precipitated or hydrated, from whatever source obtained," yet, in pointing to the sources, you have simply intended artificial sources and no other; and the patent having been sustained upon that ground, you cannot now turn round and say, having succeeded in supporting your patent by that argument, the court is to hold that any oxide, although precipitated in a state of nature, is to be treated as an oxide, the use of which for the particular purpose alleged is an infringement of your patent. The first remark, of course, which one has to make upon the whole case, and which has been several times used in the discussion, is that you must be careful to observe that the plaintiff does not claim (of course, he could not claim) any patent right in producing the oxides themselves. The patent which is claimed is the use of the particular oxides described (whether too largely or not is the question), for the purpose of producing the effect described upon the products of gas. Therefore, unless it had been for this difficulty, the plaintiff would have had a right to say: "I have been the first person who discovered that this particular article—namely, precipitated or hydrated oxide of iron, will clean gas; and, therefore, from whatever source that may be obtained, I claim the sole right of applying it to the purpose designed by my patent—namely, that of cleaning gas." The course of argument has taken certainly a somewhat singular turn—no doubt, it was amply and abundantly justified—and it is an argument, requiring serious and grave deliberation, as to whether or not the plaintiff has not now been concluded from claiming anything, though precipitated, found in a state of nature as precipitated, if it has been found precipitated only in that state of nature, and that precipitation has not been produced by the hand of man? I think, unquestionably, from the course of argument taken by counsel, and the view adopted by the judges upon that subject, that considerable ground has been laid for viewing the matter in that light, because the parts mostly relied upon have been parts of the judgment of Baron Bramwell, which I relied upon, for really my judgment was founded upon his, and follows his, and that part of the Lord Chancellor's judgment which, though differing in some degree from Baron Bramwell's precise view, yet, to a certain extent, is founded upon the same principles. It is said thus: "You did not call them precipitated hydrated oxides; but you called them 'precipitated or hydrated oxides;'" upon which there was a twofold argument on the part of the plaintiff. The plaintiff said, first, "precipitated or hydrated" merely means hydrated through the medium of precipitation—that they are really used as equivalent terms—precipitated (that is to say, hydrated by precipitation) oxides of iron. That seems to have been the view adopted by Baron Bramwell, and a view from which I should not myself feel inclined to dissent. The Lord Chancellor took this view. He said: "The defendant has argued this upon precipitated being contrasted with hydrated, put in opposition; namely, precipitated oxides of iron, *or* (that is to say, a different thing) hydrated oxides of iron." But, the Lord Chancellor says the point of view—which is the one in which I rather prefer to consider the case—is, that he is taking precipitated and hydrated together, and as being the two exactly equivalent things pointed out by the patent. But, taking it as contrasted (these are his words), I have come to the conclusion that, by hydrated, though contrasted, he meant simply hydrated artificially; and throughout, in the course of the argument, everything pointed to the laboratory, and a preparation made artificially by this gentleman for producing hydrated oxides; and, therefore, he conceived that the proper mode of reading it was to treat it as if it was applied to hydrates produced artificially. These are his exact words:—"The last subject of argument before me turned upon this—whether the plaintiff's specification was itself open to a similar objection—namely, in using words in a sense too general for the actual truth—that is to say, in describing the agent which he employed under words that would cover substances not capable of being usefully employed; and the particular words in the plaintiff's specification are, that he makes use of hydrated or precipitated oxides; and it is said that 'precipitated' is there opposed to 'hydrated;' that there are some hydrated oxides which would not answer the purpose; and that, therefore, the plaintiff's specification is bad, for too great generality and for inaccuracy. But, upon examination of that specification, my opinion is, taking the whole of it together, that the only hydrated oxides (granting that that word is to be opposed to 'precipitated,' and disjoined from it) described by the plaintiff are the artificial hydrated oxides; and it is not pretended that there is any artificial hydrated oxide which will not answer the purpose. An objection was raised in the Court of Exchequer, by treating the word 'precipitated' as narrowing, and correcting the generality of the word 'hydrated.' I prefer, rather, to rest upon the explanation that I have given—namely, that, if the word 'hydrated' be taken by itself, and be considered as including more than precipitated oxides, it must still be confined to those hydrated oxides which are artificial; and there is no proof or suggestion that there is any known artificial oxide that will not answer the purpose." Now, it was pressed very strongly upon me that, with that view, and with the view that I expressed myself, taking Baron Bramwell's view, it is impossible to say that this oxide, which at present I am assuming to be precipitated, and found in a state of nature precipitated, is one included in the patent. [His Honour having referred to some passages in his own judgment in *Hills v. Evans*, proceeded as follows:] I certainly refer, following the line of argument which has been adopted, to artificial oxides, as contrasted with what are called native oxides. But I think the comment nevertheless made by the counsel for the plaintiff extremely just in this case—that we must always bear in mind the points which are being considered. The point being considered was, whether some oxides found in a state of nature, native oxides as they are here termed in a state of rock, not in any form presenting the appearance of having been precipitated by artificial processes, but precipitated by some entirely different process than that which is analogous in any way to the process of the laboratory; and, in discussing that subject, although there is not a word about "artificial" in the patent, the mind being directed to those particular native hydrated oxides which would not do—namely, in that rocky form—the whole argument and discussion took the course of treating those hydrated oxides which would not answer the purpose as distinguished from these, because they did not partake in the least of the character of artificial oxides; they were not precipitated—they were found in that state of nature—were of an entirely different character, and had no analogy at all, or did not represent in any way what this gentleman had been describing as produced in the laboratory by some ordinary process of precipitation. That being so, the Lord Chancellor's view is undoubtedly much more favourable to the plaintiff than the view either expressed by Baron Bramwell or myself, because the Lord Chancellor says: I prefer taking it thus—precipitated oxides as opposed to hydrated. If opposed to hydrated, then precipitated includes every precipitated oxide: you have nothing to do with a state of nature or otherwise. He disjoins hydrated from precipitated—opposes it to it; and says the difficulty is, whether hydrated being opposed to precipitated, I do not find some class of hydrated oxides which would not answer the purpose; and he says: "I should find in nature certain oxides which do not answer the purpose; but, when I look through the whole of this gentleman's specification, I think he means only such hydrated oxides as are produced in the laboratory." I believe they would all be precipitated; but, at the same time, the Lord Chancellor takes precipitated as contrasted with or disjoined from hydrated; he uses both words; he disjoins precipitated from hydrated, and says, it is, therefore, an alternative proposition—I claim all precipitated oxides; and I claim, also, all hydrated oxides; but hydrated oxides, says the Lord Chancellor, such as I have here described, as prepared through the medium of the laboratory. Now, of course, that would be a great deal more favourable to the plaintiff's view, because the plaintiff's view is this—I claim any precipitate; and, of course, if you disjoin the two, then he is no longer embarrassed with the word "precipitated," because all precipitated oxides answer the purpose. Every precipitated oxide known, natural or artificial, answers the purpose. Therefore, he is no longer embarrassed at all by the "precipitated" being too large a class; but the embarrassment did rest upon "hydrated" being too large a class. The Lord Chancellor relieves him from that embarrassment by confining him in the use of the word "hydrated," and leaving the word "precipitated" to its full operation. Therefore, upon the assumption on which I have hitherto gone, that, by the ordinary laws, as I have said, implanted by Providence upon these substances, this substance has been produced in exactly the same mode as man can imitate it in the laboratory, it is not less a precipitate of iron, because it can be precipitated by ordinary processes without man's assistance. No doubt, many of my expressions with regard to rust, and the difference between rust and ochre, would have a contrary bearing. But we attend to the argument which is addressed to us as having a special bearing upon the particular subject matter before us; and the question is, when a gentleman has not in the least confined his specification, otherwise than the legal construction has confined it, if I do not find that legal construction so necessarily confining it, as to make it impossible for him to claim a native oxide, I ought to introduce any restriction which has not been, by legal construction, already introduced into the specification of this patent. Now, if you take all the analogies which can be suggested, they would be in favour of this gentleman. If a gentleman describes a sublimate of some particular substance as a thing to be used—not claiming the patent of the article, but the application of a particular article in a particular manner; and if he says he claims the application of certain sublimates produced in the laboratory, and describes his mode of producing them; and says, the best mode is to proceed by such and such a process, by distillation—I say, if you afterwards find at Vesuvius the same thing going forward by the immense laboratory there at work, and any person could scrape a substance from the top of a cavern, and said: "This is not a thing produced by the laboratory; and I, therefore, claim the right to use the thing," it would be entirely absurd. If it is a precipitated oxide, it seems to me to be a thing which the plaintiff has discovered as useful for effecting the purification of gas; and the only question to be determined is whether it is a precipitated oxide or not? I have assumed all through that this is a precipitated oxide; that it is a hydrated oxide is quite clear; but, of course, there the objection would apply, unless it was also precipitated, because there are native hydrates found which would not do; and upon this point there is some little difficulty. I confess the preponderance of evidence appears to me very strong; I cannot, in truth, understand how this could be otherwise than precipitated. But still, there is evidence, and I am upon an interlocutory injunction; and the Lord Chancellor thought it right to offer to the parties to try all matters of fact. It is not the jurisdiction of this court to decide matters of fact; but the Lord Chancellor thought it right to offer a process of trial upon any disputed matter of fact; and the course which I should take upon this matter would be to direct an inquiry as to whether or not this oxide so used was a precipitated oxide. That is the course which I should feel inclined to take, but I have to press the second question on the attention of the defendants, before they consider whether or not any such inquiry should be taken. Now, the second point suggested by Mr. Grove in reply will unquestionably arise, as it appears to me upon this first part of the case—viz., if you assume that the defendants do use this oxide which has been found in a state of nature for the purpose of purifying gas, the plaintiff says, then you expose it according to my second process (which I will not

at this moment consider) to the action of the air; and, when the air has acted upon it, you really do then produce artificially, when the revivification has taken place, a precipitated oxide of iron; and so, when you come to use that article which you thus revivify a second time, you literally fall then within the description of my patent, which, confine it as you will, reaching precipitated oxides would be a user, which is an infringement of the process which I protected by my patent. That is the first point raised. Then, there comes the second point, which is this: The plaintiff says, "Well, even if I granted you that the materials used by you, in the first instance, are not an infringement of my patent, I secondly claim the right of renovating or reoxidizing the said purifying materials, by the action of the air, whenever they, from time to time, cease to absorb sulphuretted hydrogen, so that they may be used over and over again to purify the gas." On this second part of the patent, this point was strongly pressed upon me: you say, "the said purifying materials." Now, if I can get a material which is an exact equivalent of yours, and which, when converted, will be found precisely in the state in which the material you first used would be found; then, inasmuch as in the first instance it was not protected by your patent, I now may use this process of purification which you use, in every respect, because I do not use it on the "said materials." And, further than that, there is no question upon the fact (the defendants are quite right in that argument) that it is the "said materials," in the strictest sense, because, in the original description of the mode of purification, in page 12 of the patent, Mr. Hills points to the same material in every case. Of that, there can be no question. But, in point of law, it is quite clear to my mind that, if this article which the defendants use should not be a precipitate, but something else which, in a state of nature, you find will purify exactly in the same way as the oxide of iron will combine exactly in the same way (I am now assuming it not to be a precipitate on this part of the case, but something which you find in nature which, not being a precipitate, will answer the purpose), you have something, not a precipitate, which answers the purpose, and, when that purpose is answered, it is answered in exactly the same way, by exactly the same chemical combination taking place in the withdrawal of the sulphuretted hydrogen by the operation of the oxide. Then, you arrive at a material which, after all, has now become identical with the material which is used by the plaintiff when the plaintiff's material has been subjected to the same process. You say, then, I have got something which becomes, chemically, exactly identical with the plaintiff's, upon the process being pursued which the plaintiff has recourse to with his particular material, protected by his patent. Well, having done that, the question before me is, is the construction of this patent to be so narrowed that, with regard to the second claim—namely, a claim to a particular material which he uses for the purpose of purifying gas—he can revivify these materials by the mere process of subjecting them to the action of the atmosphere—that being the mode of revivifying the materials so used, unknown heretofore—I say, is the claim of the plaintiff to be so narrowed that, when I find precisely the same thing to be done—namely, that the identical thing has to be revivified, which has to be revivified in the case of the plaintiff's patent—I am not to say it is an evasion of the plaintiff's patent, because the thing with which the original purification was effected was not identical with the thing described in this patent; though the substance arrived at, when the first process had been performed, does become identical with the substance arrived at when the process described by the patent has been followed. I must say, upon this second branch of the plaintiff's claim, that the defendants clearly cannot use this process of revivification, whether this iron be said to be a precipitate or not. That is what I said I should mention before I put it to the defendants, whether it would be worth while to have an issue upon the fact, whether that is a precipitated oxide or not? I feel myself in a position to say that the defendants ought now to be enjoined from using the process described in the plaintiff's patent, of reoxidizing the purifying materials used by the defendants by the action of the air, "whenever they from time to time cease to absorb sulphuretted hydrogen." I am told that if that part of the case is within the patent, the former is useless. I do not know whether that is so or not, but I think the safer course will be to say that the defendants may have an issue if they think fit (I shall put it upon an issue, and not upon an action), whether the material as used by them in the process of purifying gas, in the first instance, is a precipitated oxide of iron. That is the form in which I shall put it. Then, I at once grant an injunction to restrain the defendants from renovating or reoxidizing the purifying materials used by them by means of exposure to the air, "so that they may be used over and over again to purify the gas." I take the very words of the patent, that I think the plaintiff is entitled to, and the defendants will say whether they wish to have that issue or not.

Mr. DRUCE: It is right I should say that the case will be carried further.

The VICE-CHANCELLOR: No doubt about it.

Mr. DRUCE: Your honour will probably draw up the order, giving us that issue, without putting us to say whether we use it or not.

The VICE-CHANCELLOR: No; I think I should ask you whether you will take the issue or not; because I am to assume that my order is made now.

Mr. DRUCE: I do not forego any issue that I have a right to.

The VICE-CHANCELLOR: That is in substance asking for the issue.

Mr. MARTEN: Your honour will not grant any injunction as to the use of the first part?

The VICE-CHANCELLOR: No; until I know whether this is precipitated oxide of iron.

Mr. MARTEN: Then, in the event of your honour making an order for an issue, might I venture to suggest that it might be tried before your honour? The Lord Chancellor expressed the strongest opinion against sending the case away again from his court, and said he would try the whole case himself; and he was going to examine witnesses, *viva voce*, in *Hills v. Evans*, if the defendant insisted upon disputing the infringement.

The VICE-CHANCELLOR: If the Lord Chancellor said that, I should certainly try the issue before myself upon the same grounds.

Mr. DRUCE: The question is, whether, we lighting the whole town of Liverpool with gas, should not have the six weeks before the injunction comes into operation?

The VICE-CHANCELLOR: I think that is quite reasonable. I will draw up the order thus:—The defendants, not admitting that the substance used by them in the first instance for purifying gas is a precipitated oxide of iron, let an issue be tried before this court upon the following question—namely, is the material used by the defendants in the first instance for purifying gas a precipitated oxide of iron? Then restrain the defendants from making use of the plaintiff's invention in "renovating or re-oxidizing" the purifying materials used by them, whether the same be a precipitated or other hydrated oxide of iron by the action of the air, "whenever they from time to time cease to absorb sulphuretted hydrogen, so that they may be used over and over again to purify the gas." This injunction not to take effect for six weeks from the present time. The trial of the issue will be before myself and a jury.

COURT OF QUEEN'S BENCH.

WESTMINSTER, WEDNESDAY, FEB. 12.

(*Before Mr. Justice* MELLOR *and a Special Jury.*)

STEGGLES *v.* THE NEW RIVER COMPANY.

Mr. Serjeant HAYES and Mr. HARINGTON were counsel for the plaintiff; Mr. BOVILL, Q.C., with another learned gentleman, for the defendant.

This was a second trial of the same cause. On the former occasion, the jury could not agree, and were discharged without giving a verdict.

The action was brought to recover compensation for the damage which the plaintiff had sustained by reason of the water-pipes and plugs belonging to the defendants being in such a state that the water rushed through the pipes into the cellar of the plaintiff, and caused him great damage.

The plaintiff was the occupier of the "St. Luke's Head" public-house, in Old Street. At Christmas, 1860, there was a very severe frost; the plaintiff had gone to bed rather early, but was called up in the course of the night, not by a cry of "Fire!" but by a cry of "Water!" He immediately got up, and, upon going down into his beer-cellar, he found it filled with a liquor for which it had not been adapted. The cellar was filled with water, which was running into it in large quantities from the defendants pipes. The turncock was fetched, and he put a stop to the leak; but the plaintiff had suffered very considerable loss. The plaintiff contended that there had been great negligence on the part of the company, in not having proper contrivances to prevent this extraordinary overflow of water from their pipes. Upon the defendants being applied to, they denied their liability, and said the accident had arisen from the defect of the parish fire-plugs; and they referred the plaintiff to their solicitor. This action was then brought. The learned counsel urged that it was the duty of the defendants, in severe weather, to take extraordinary care, and adopt every means to prevent accidents; and submitted that, upon the present occasion, the defendants had neglected to do so.

The plaintiff, in detailing the nature of the case, stated that the parish had come to a resolution that, if he had pluck enough to bring an action against the New River Company, and if he should be beaten, the parish would give him £60 towards his loss. The plaintiff said emphatically that he would rather lose his coat than be beaten by any man.

A clerk from the office of the vestry-clerk stated that the parish never repaired the fire-plugs.

The surveyor of the parish stated that the officers of the parish did not go round yearly to look at the plugs to see that they were in order; but, one year a churchwarden did go round, taking with him the New River turncock; but, his reason for doing so was this—he said the parish was obliged to keep the parish engine in repair, and what would be the use of that if the plugs were not all right?

The turncocks of some of the water companies were called, and they stated that the course was to put straw round the plugs and fill up the plug-holes, and then to leave them sometimes for years.

For the defendants, it was contended that the parishes were bound by Statute to keep these plugs, which were in truth fire-plugs, in proper repair. The plug in question was packed with straw in the usual manner about November, and thus it remained until the time of the accident. The defendants had adopted the usual course, and had taken the proper care. The pipe had burst in consequence of the frost, but the defendants could not be responsible for such an accident, because they were not guilty of any negligence.

The turncock of the defendants proved that he had properly packed this plug on the 29th of November. He examined it about a week before Christmas, and it was all safe. He was called to the accident. He found that the plug had started a little, and caused a leak; he then drew out the plug, and let the water out and the air in, and that put all right. Christmas night was one of the coldest that had been known for years.

By the JURY: He had no particular reason for looking at this plug the week before Christmas. He examined several others on the same day.

The foreman of the company stated that the turncock had reported to him that he had packed this plug on the 29th of November. The turncocks had directions to look at the plugs whenever they went past them. About 200 extra men were taken on that winter to attend to the stand-pipes, which were put on at the time of a frost.

The learned counsel addressed the jury on behalf of their respective clients.

Mr. Justice MELLOR summed up.

The jury found a verdict for the plaintiff for the amount which the parties had agreed upon, after having been locked up from five o'clock to half-past six o'clock.

MONDAY, FEB. 17.

(*Sitting in Banco, after Term, before Mr. Justice* WIGHTMAN *and Mr. Justice* CROMPTON.)

THE QUEEN *v.* THE LONDON AND NORTH-WESTERN RAILWAY COMPANY.

This was a case stated by the Staffordshire Quarter Sessions for the opinion of this court, and which raised a question as to whether the London and North-Western Railway Company had been rightly convicted by the magistrates at Lichfield of the offence of having an incorrect weighing-machine in their possession, which it was alleged, was 21lbs. weight out of the balance. It appeared from the case, that the weighing-machine in question was at the Lichfield station, and was a weigh-bridge used in weighing goods in trucks, &c. The machine had a patent adjusting apparatus, so constructed that the machine might be made to balance to the greatest nicety, but, when it was examined by the inspector, although it was in gear, it did not balance, but was incorrect to the extent of 21lbs.

Mr. J. E. DAVIS (with whom was Mr. G. BROWNE) supported the conviction, and contended that, as the machine was in gear, and could be used, it was an incorrect machine; though, he admitted that, when properly adjusted, it would balance with the nicest accuracy.

Mr. Serjeant HAYES and Mr. S. HILLS appeared for the appellants, but they were not called upon.

Mr. Justice WIGHTMAN said the conviction could not be supported. The machine required adjustment before it could be properly used, but that did not make it an incorrect machine within the Act of Parliament.

Mr. Justice CROMPTON said, he doubted whether the machine had been properly examined. His lordship said he did not think the machine was an incorrect machine, merely because it required adjustment before it could be properly used; on the contrary, he thought it was the beauty of the machine, that it was made to secure peculiar correctness.

Judgment for the appellants.

Miscellaneous News.

REPORT AND BALANCE-SHEET OF THE PHŒNIX GASLIGHT AND COKE COMPANY.

The following is the report for the half year ending at Christmas, 1861, to be submitted to the proprietors, at the half-yearly meeting, to be held on the 26th instant.

Since your last meeting, the new retort-house at Vauxhall has been brought into successful operation, and has been of great service during the present winter. The new coal-store, at the same station, has also been completed, and filled as a reserve against any interruption in the requisite supply of coals that might occur during the winter. Much new machinery has been fixed, and new offices, with a residence for the superintendent, have been erected.

Extensive premises, adjoining the station at Bankside, have been taken, by means of which a large additional coal-store, a smith's shop, increased wharfage, and the much-required convenience for landing coals by steam-power have been obtained.

During the last two years, the large sum of £45,845 has been expended in extending the company's works, whilst the capital raised has been only £35,495; and the cost of the further extensions, which it will be necessary to complete in the current year, has been estimated at about £14,000. It is obvious, therefore, that the amount of paid-up capital must be increased at no distant period.

A net profit of £25,514. 7s. 11d. has been realized, out of which your directors recommend that a dividend, at the rate of 5 per cent. for the half year, be declared—leaving £56. 2s. 2d. to be added to the undivided balance of £6333. 6s. 3d., making a total of £6889. 8s. 5d.

In accordance with your Act of Incorporation, the directors now resign into your hands the trust you have reposed in them, and they offer themselves for re-election, in the confident hope that their management has met with your approbation.

Dr. *Abstract of the Trade Account, for Six Months, ending Christmas*, 1861. *Cr.*

For Coals used			£28,125	4	0		
Tradesmen's bills, for materials supplied			10,200	13	9		
Law expenses			42	6	4		
Meters, and repairs thereof			1,223	14	0		
Rent, rates, and taxes			2,325	10	1		
Directors, £750; auditors, £50			800	0	0		
Salaries			3,317	2	2		
Wages paid			10,441	14	0		
Bad debts and allowances			400	15	1		
Balance of interest			50	19	6		
Net profit			25,514	7	11		
			£82,442	6	10		
By Rental for light						£64,987	0 0
Coke made for sale						14,117	7 11
Breeze, ditto						249	12 11
Tar, ditto						2,001	1 1
Ammonia, ditto						1,087	4 11
						£82,442	6 10

Dr. *Abstract of the Balance-Sheet, at Christmas*, 1861. *Cr.*

For Capital of 9000 £60 shares, £55 each paid up					£495,000	0	0	
Unpaid dividends					195	10	8	
Unpaid tradesmen's bills, &c.					15,632	0	5	
Investment-fund					5,670	12	1	
Balance of profit and loss—								
Undivided balance			£ 6,833	6	3			
Half year's profit			25,514	7	11			
					32,347	14	2	
					£548,835	17	4	
By Amount of plant at Midsummer last						£445,841	13	8
Add—								
Expended this half year in extension of works						13,150	5	0
						£458,991	18	8
Securities for investment-fund						6,200	0	0
Amount due from sundries—								
Christmas quarter					£42,419	17	10	
Arrears					921	7	2	
						43,341	5	0
Amount due for coke					£3,810	5	1	
Ditto breeze					136	6	4	
Ditto tar					1,576	3	10	
Ditto ammonia					843	8	11	
Ditto sundries					3,025	1	8	
						9,391	5	10
Stock of coals					£9,292	10	0	
Ditto coke					420	0	0	
Ditto breeze					48	12	6	
Ditto tar					365	3	6	
Ditto ammonia					187	4	0	
Ditto retorts					570	13	0	
Ditto meters					17,131	11	3	
						28,015	14	3
Balance at treasurer's						2,895	13	7
						£548,835	17	4

J. Church Bailey, } *Auditors.*
Joseph Box. }

EUROPEAN GAS COMPANY.

An Extraordinary General Meeting of the Proprietors of this Company was held on Wednesday last, at the Office of the Company, Frederick's Place, Old Jewry—Joseph Brown, Esq. (in the absence of the chairman, who was prevented from attending), in the chair.

The usual formalities having been complied with,

The Secretary read the following report:—

Gentlemen,—The purpose of this meeting being to consider the progress made by the company, without entering into the question of accounts, which cannot be made up until the termination of the financial year on the 31st of March, your directors proceed to lay before you a short statement regarding each station.

Amiens.—Increase of lights, 525. The greater part of this increase took place towards the end of the year, so that the full advantage will not operate on the result of the accounts to be closed next month; but it may be hoped that the increase will go some way to compensate for the effect produced by the depressed state of manufactures in this town, where so many factories are lighted by gas, so long as posperity prevails.

Arrangements are being made with the mayor, by means of which a share of the extension of the public lighting will be allotted to this company, on terms far more favourable than those on which the French company took the contract for the whole town, ten years ago, inasmuch as the lighting is confined to streets where the company has already mains, and the outlay required, if any, will be merely nominal.

Boulogne.—Increase of lights, 870. The improvement which for some time past had been manifest in this town has steadily continued. The bathing season is considered to have been an unusually favourable one, and the trade of the place has been active; moreover, an additional pen factory has been opened, and from this a great portion of the increase of lights above reported was obtained.

The rapidly enlarging consumption in this town will shortly render it necessary to extend the retort-house, and provide additional storeage for gas; but your directors hope by judiciously husbanding existing resources to defer this necessary outlay until next year.

Caen.—Increase of lights, 566. Although the demand for gas continues satisfactory, it has not been throughout the year on such an extended scale as to render the new tank and gasholder indispensable. Your directors, therefore, determined to defer until the spring repairing the effects of an accident which occurred to the tank whilst being filled. The gasholder is quite ready for use, and will be brought into operation as soon as required.

At this station also, measures cannot long be deferred for extending the means of manufacture, and as the present retort-house has already reached its utmost limit, considerable outlay must be looked forward to for the construction of a new and suitable building.

Havre and St. Adresse.—Increase of lights, 1040. The magnitude of the works which your directors were under the obligation of undertaking in this town last year, has engrossed much of their attention, and the greater part of the advantages anticipated therefrom would probably have been more immediatly realized, had not several untoward circumstances occurred. Whilst the works at the new station were in rapid progress, and the entire town was being lighted from the old works, a fire, the origin of which still remains undiscovered, broke out there on the 18th of September, and caused great alarm; but, owing to the strenuous exertions of the firemen employed, as also of the officers and servants of the company, the flames were subdued in time to prevent any greater damage than the destruction of buildings used as a purifying-house and a coal-store, and which were insured; added to which, as the working of the station was to be given up on the 31st of December, the re-establishment of a great part of the premises was not called for. Although the damage done was not great, yet the subsequent inconvenience occasioned in the manufacture and purification of gas was considerable. However, your directors met with sympathy and assistance on the part of the authorities and inhabitants, and had nearly reorganized the proper working of the establishment when, on the 9th of October, an iron roof, which was being placed over the new retort-house, and was nearly finished, fell in, causing considerable damage, and injuring several of the men who were at work under it. The loss occasioned by this accident should, in the opinion of your directors, have fallen exclusively on the contractors; but, when the case came on for trial, it was judged that one of the company's servants was partly in fault, for placing an undue strain on one of the ties. Such being the award given, your directors entered into arrangements with the contractors for settling all differences, each bearing a part of the expense. Thus, the effects of this accident, which might have led to serious consequences, including loss of life, were disposed of without any very heavy cost to the company; but, it then became a serious question whether the new works could be completed by the time imperatively fixed in the treaty with the town—viz., the 31st of December. Every nerve was strained to achieve this. Engineers were sent from England, and all that could be effected was done. With such energy of action, and thus ably seconded, your directors were enabled to fulfil their engagements, by lighting the whole of the town from the new works on the prescribed day, and extinguishing the fires at the old station. But much was hurriedly done, and it cannot be expected that the working, which has been so seriously interfered with by these accidents, will, within the present financial year, have yielded in full the favourable results which were originally anticipated.

However, the confidence of your directors in the ultimate advantages to be derived from the recent purchase remains unabated. The town is already extending so rapidly, and so much beyond what was immediately contemplated, that the consequent demand for gas must proportionably increase, and it will be advisable to look forward, for some years, to a considerable annual outlay of capital, to meet the growing demands of this important place.

In order to facilitate the sale of appropriate gas-fittings, cooking-stoves, and various apparatus, your directors entered into an arrangement with the principal fitter in the town, whereby a large business was at once transferred to the company. An establishment, with a spacious show-room for conducting this department, has been opened in one of the most frequented parts of the town, and has beneficially attracted much notice from the public.

Nantes.—Increase of lights, 1577. The progress made here has been satisfactory, and the local exhibition held during several months brought a great concourse of visitors to the town. The effect on the interest of this company was perceptible, but necessarily of a temporary nature.

The cost of coals supplied during the year has been in excess of the average, owing to a large number of the ships of this port having been used for bringing grain from England. They would, under usual circumstances, have been advantageously available for coals as a return freight, cargoes of grain or flour, in ordinary seasons being exported to England. Failing this, your directors had great difficulty in obtaining ships even at high rates of freight.

The new retort-house has been in full work throughout the winter, and so favourable are the expectations entertained by your directors regarding the rapid development of the company's business here also, that they contemplate, at no distant period, considerable outlay for further increasing the means of manufacture. As regards storeage, it will probably be found indispensable to provide this station with another large gasholder next year.

Rouen and Sotteville.—Increase of lights, 267. Your directors regret to state that the improvement to which they looked forward in respect of this station has not yet taken place. It is well known that the American war has had a very prejudicial influence on the interests of the town of Rouen, and, such being greatly felt by the manufacturers, from whom the principal part of the rental of this company is derived, it is evident that its business must unavoidably suffer so long as like circumstances prevail; but, as soon as a revival shall take place, it cannot be doubted that not only the former demand for gas will be resumed, but that a further increase of consumption will be one of the results.

Your directors, in order not to be unprepared, propose to telescope the large gas-holder during the ensuing summer. The outlay will not be considerable, but next year it will be necessary to provide more retorts, either by extension of the present retort-house, or by constructing a new building.

Your directors have received repeated applications from the authorities, to lay mains in every part of their district at present lighted with oil, but seeing that the proportion of private lights would be below the average generally looked for, they steadily declined to engage in such outlay. The mayor was at length induced to determine that the town should take upon itself the expense, and a treaty was entered into by your directors, the principal conditions of which are, that the company shall provide and lay the mains required; to be repaid with interest, but by instalments, in the course of five years; the company to have liberty to supply gas from such mains for private lights, as well as for public lamps.

Summary.—Total increase of lights, 4845. Notwithstanding the many drawbacks that have attended the operations of the company during the past year, your directors did not see reason to expect more than a temporary interruption to the course of progressive improvement, which, for several years past, it has steadily enjoyed, and, therefore, felt the more free to consider the suggestion made at the last meeting, that a more equal division in the half-yearly payments out of profits should be adopted. It was decided that 8s. per share should be paid on the 1st inst., and dividend warrants were forwarded to every shareholder accordingly: the sum of £20,000 has been issued on account of £25,000 authorized by the shareholders to be raised. It is not proposed to call for the balance at present; but, as the business of the company is so evidently extending in every direction simultaneously, and with unprecedented rapidity, so soon as trade shall revive, it may naturally be expected that the annual outlay will continue to be large during some years to come. The occasion for this contemplated expenditure must be taken as an undoubted proof of the growing prosperity of the company.

The CHAIRMAN then rose, and said: Gentlemen, you are perfectly well aware that it has been our invariable habit—whether we meet you at an extraordinary meeting or at our annual meeting—as partners, to let our report be so full as to give you the largest information with reference to each of our stations. I am relieved, happily, at this moment, meeting you at the twelfth hour very unexpectedly, from going particularly into details, because you have had them fully read to you in the report. You will find that, at all our stations, except Rouen, we have made considerable progress. At Rouen, we did anticipate, certainly, twelve months ago, a large increase of business; but the American crisis came on. The Manchester of France has suffered as much as the Manchester of England, and many of the lights which we have there established are not lighted, for want of business. We hope that business will shortly arrive; it must depend a great deal upon America, and, therefore, we cannot enlighten you any further than you can enlighten us upon that point. You find at Amiens, at Caen, at Havre, and at Nantes, we are progressing far beyond even our most sanguine expectations. The total gives us the large amount of 4800 additional lights. They have been chiefly added towards the latter part of the winter, and, therefore, we are not deriving the advantage from them so much in our present accounts as we shall in the year 1862. The whole of our stations warrant us in the belief that we are progressing towards a great extension of business. You know that we were a considerable time before we called upon you for additional funds, although our workings were very largely in advance of our capital; but, at length, we called upon you for £75,000, and, as stewards, we are bound to give you, even if you did not ask it, something like an explanation of the expenditure of that £75,000. We have called up £70,000, and there remains £5000, which we could immediately issue. We have many shareholders who are extremely desirous to take our bonds; but we having always acted upon the principle of husbanding our resources—not paying interest for capital until we absolutely required it, have only had £70,000 out of the £75,000; £60,000 of that has been consumed at Havre, where we have had to erect one of the most complete works in France. I believe that there is no station in France which will excel the new station of the European Company at Havre, when finished. The two companies are now conjoined into one, in the first place; and, in the next place, we have not only to make preparation for the lights we have, but for the lights we believe we have very largely in store. (Hear, hear.) In point of fact, we are almost afraid of anticipating what our wants may be for Havre. It is considered by merchants in that town—well-informed men, with whom we are frequently in communication—that Havre will immensely increase; and, therefore, we have to take the *juste milieu*, prepare against a surprise, and look ahead to see how far additional capital may be required. We hope it may be wanted, for it will be most advantageously laid out in the extension of gasholders, pipes, &c. I should be misleading you into a very undesirable expectation, if I told you that we should not require additional capital. The last clause in the report I most heartily concur in. I think you must be rather pleased to hear that last paragraph, which contemplates that the time will come when, by the repeated extension of our works at the different stations, we shall have to call, from time to time, for additional capital. I hope so. I see many gentlemen here, connected with gas business, who would readily tell you that 4800 lights cannot be supplied without a very large increase of capital. We have, as I have said, been husbanding our resources; and, by having so excellent a fund as that we provide, we have been able to achieve this with only £10,000. Now, at Nantes, we look for very great things; we have laid out a great deal of money there, and we hope we shall have to lay out money there next year for a new gasholder, which, of course, cannot be erected without the expenditure of some thousands of pounds. We have likewise Rouen, and we have Caen, and I think I may say that we have, altogether, a more cheering prospect than upon any occasion when we have had the pleasure of meeting you. I can only say, what is known to you all, that, as regards the Emperor, there is an *entente cordiale* in reality; that has allayed those little jealousies that we felt as well as others, and we are now looked upon in France, not as the *perfide Albion*, but we are received with great cordiality, not only by the Government, but by the people, who take our gas, and are increasing their lights; and, as soon as France gets into a more healthy condition, we believe it will be highly beneficial to the European Company. (Hear, hear.)

Mr. SMITH: You consider Havre the Liverpool of France?

Mr. DEW (a director): Quite so.

Mr. SMITH: You have borrowed £70,000, and £60,000 has been expended at Havre in the erection of new works.

Mr. DEW: Yes; that is the expenditure up to the 31st of December.

Mr. SMITH: How do you calculate your increase of lights there?

The CHAIRMAN: Taking our calculation of the lights given to us when we purchased the works of the French company, and taking our own at that period, we have increased upon the joint number 1000. (Hear, hear.)

A PROPRIETOR: What is the total number of lights now?

Mr. BACKLER (the secretary) said, 72,732.

Mr. CURLING: You mentioned the probability of our requiring a larger amount of capital than we have already; will it be necessary to go to Parliament in order to raise additional capital?

The CHAIRMAN: No; but it will be necessary to come to our Parliament here. (A laugh.) We cannot raise any money without its being sanctioned by two meetings, and showing you that we can advantageously invest it.

Mr. MARTEN: The money borrowed is raised upon the whole of the works?

The CHAIRMAN: Yes.

Mr. MARTEN: For what period are the debentures issued?

The CHAIRMAN: Three, five, seven, and ten years.

Mr. LEWIS: I think, when you issued your last debentures, you said that, after a certain day, they would not be issued at 6 per cent.?

The CHAIRMAN: They were all taken up, and we had more applications than we had bonds to issue. Gentlemen, I will now move—"That the report of the directors now read be received and adopted."

Mr. FAWCETT: I second that.

The resolution was carried unanimously.

Mr. FAWCETT: I will just take this opportunity of asking one question; and, at the same time, I congratulate ourselves upon the extremely favourable report which has been submitted to the meeting. I think it is one that must give us all exceeding satisfaction, because, no doubt, we are in a very good state now, and have every reasonable expectation of being in a much better at no distant period. I did not clearly understand whether the increased dividend we have received at this portion of the year, which is the largest we have ever received at this time, was to be attributable entirely to the fact of the directors wishing to equalize the dividend—that is, whether we may fairly expect to receive so much less in August, having received so much more now? or whether there is any chance of our perhaps receiving as large a dividend in August as we did previously?

The CHAIRMAN: I shall be very happy to answer that question. The truth is, we are here from week to week; we have our accounts before us; we know how our lights increase; and we know pretty well how our profits progress. Upon that knowledge the report has been founded; and from that knowledge we see that we are perfectly justified in giving an instalment of 8s. per share, instead of 6s., towards our dividend which accrues in August. We have come to no judgment whatever what our dividend then will be; but we feel satisfied in paying you an instalment of 8s. The principle upon which we have gone is not calculating upon an expectation that we shall increase our dividend. Many of our friends have found that it was very convenient to receive an advance of money in February to pay Christmas bills; and we have been requested for years to do what we have recently carried into effect.

Mr. FAWCETT: Your answer is entirely satisfactory; and, as I believe the business is concluded, I have much pleasure in proposing a vote of thanks to the chairman and the board generally for their able management of our affairs during the past six months.

The resolution, having been seconded, passed by acclamation, and was acknowledged by the chairman.

Mr. LEWIS moved a vote of thanks to Mr. George Lowe, the engineer, and Mr. Backler, the secretary of the company.

The motion, having been duly seconded, was passed unanimously, and suitably acknowledged, which brought the proceedings to a close.

METROPOLIS GAS SUPPLY.

CITY OF LONDON COURT OF SEWERS, TUESDAY, FEB. 18.

At a Meeting of the Commissioners, held this day—Mr. DE JERSEY in the chair,

The CLERK read a report from the Special Committee on Gas, to whom it was referred to prosecute the bill in Parliament for the amendment of the Metropolis Gas Act, 1860, stating that the said bill was read the first time in the House of Commons on the 12th inst., and was ordered to be read a second time before the 20th inst., unless postponed. The committee further reported that the case agreed to between them, on behalf of the Commissioners of Sewers, and the Great Central Gas Consumers Company—for the purpose of obtaining a judicial opinion as to whether the provisions of the Great Central Gas Act, 1851, whereby the company were limited to a charge of 4s. per 1000 cubic feet, were repealed by the Metropolis Gas Act, 1860—came on for argument on the 6th of this month, before the Court of Common Pleas; and that four of the judges of that court unanimously decided that the Great Central Gas Company were entitled to charge the increased rate prescribed by the Act of 1860; and that the provisions of the last-named Act do repeal those clauses of the company's Act of 1851 relating to this matter. Under these circumstances, the committee, by the advice of the legal officers of the commission, recommend the court to apply for the postponement of the second reading of the bill for a short time, in order that the gas companies may have the opportunity, if they think fit, of conferring with the committee upon the matters in difference between them. In the meantime, the solicitor advises that no further steps should be taken in reference to the judgment recently obtained in the Court of Common Pleas.

Mr. YOUNG, said there was something in the report about conferring with the gas companies. He wished to know whether there had been any application on the part of the gas companies for that purpose?

The CHAIRMAN said, his friend would see that, though that might be a very proper question to put, it was one which he must excuse him for not answering. He thought they would be exercising a sound discretion by not discussing this matter. The way in which the report was drawn showed the commission that it was a matter which must be dealt with as quietly as possible. If the commission would have the kindness to place the matter in the hands of the committee, and have confidence in them, remembering that they are acting under the advice of their parliamentary officer, it would be well. The request for the postponement of the second reading of the bill could do no harm, and might do good. They were all desirous to do the best for their fellow-citizens; and he thought the report recommended a course which would effect that object.

Alderman BESLEY moved—"That the court agree with the committee in their report," which was at once put, and carried.

Dr. LETHEBY presented his quarterly report on the quality of the gas supplied in the City by the Great Central Gas Consumers Company during the quarter which has just expired. Three hundred and twenty-one experiments have been made of the illuminating power of the gas, 232 of which have been made in the laboratory of the London Hospital, and 89 at the laboratory in Finsbury Square. The results are that, at the first-named place, the illuminating power of the gas was equal to that of 13·58 sperm candles, or 15·52 wax, of standard consumption; and, at the second, it was equal to that of 13·13 sperm, or 14·01 wax. These numbers give a mean proportion of rather more than 11 per cent. above the requirements of the Metropolis Gas Act, 1860, and about 27 per cent. above the standard of the Great Central Act of 1851. The average illuminating power of the gas for the whole year has been a little less than this—viz., 11·97 sperm, or 13·68 wax. These are the results of 1253 testings, of 10 observations each. The difference in the aggregate result at the two places, which are nearly two miles apart, has been only 36/100ths of a candle, showing that the illuminating power of the gas was of a permanent quality. The chemical quality of the gas has been good, as regards the absence of sulphuretted hydrogen and ammonia.

Mr. SAUNDERS recommended to the medical officer the propriety of making some of his experiments during the early hours of the morning.

Dr. LETHEBY said he thought, in the present unsettled state of the gas question, it would be better not to make any alteration in the plan hitherto adopted.

Mr. WALTERS inquired, upon whom the expense of testing the gas would fall, if any of the inhabitants were dissatisfied with the quality supplied to them?

Dr. LETHEBY said, if the result of the testing should be favourable to the company, the person requiring the test to be made would have to pay the expense.

Mr. WALTERS said, as some of the consumers were finding fault with their gas, he was desirous to know where they must go to get it tested?

Dr. LETHEBY said he did not know whether it was taken for granted that he was the testing officer for the City of London. He was the examiner for the Great Central Company; but at present there had been no appointment for the City generally.

Mr. WALTERS: Then, do I understand that you are the testing officer of the Great Central Company, and not of the corporation?

Dr. LETHEBY: I do not know, at the present moment, what I am.

Mr. WALTERS: If the Act of Parliament has for its object the testing of the gas, we ought to know who to apply to. The people are in the dark: they do not know who to apply to, nor at whose expense the test is to be made.

Dr. LETHEBY said, the question was, whether the City was under the Great Central Act of 1851, or the Metropolis Gas Act, 1860? If the former, then he held the appointment from the corporation, and the public had a right to call upon him to test their gas. But, if the Metropolis Gas Act overrode the former Act, it would be the duty of the court to appoint an officer under its provisions. He understood at the present moment that the question was in dispute.

The CHAIRMAN suggested, that it was better not to go further into the subject. It was now before the special committee for consideration, and no satisfactory answer could be given to these questions at this time.

The subject then dropped.

METROPOLITAN BOARD OF WORKS.

FRIDAY, FEB. 14.

THE ROAD ACROSS HYDE PARK.

The Ordinary Weekly Meeting of the Board was held this day at the Office, Spring Gardens—Mr. THWAITES in the chair.

A letter from the vestry of St. Marylebone was read, communicating a resolution passed at their last meeting, objecting to any portion of the expense of the proposed road being thrown upon the ratepayers of the metropolis.

Mr. SAVAGE presented a memorial from the vestry of St. Mary, Islington, stating that, in their opinion, the road was essentially a local necessity, and that it would be unjust to appropriate any portion of the metropolitan rates towards its formation.

A deputation attended from the Westminster District Board, and was introduced by Mr. Hughes, for the purpose of urging the prayer of a memorial from that board in opposition to the proposed road. The memorial set forth that, from the configuration of the Knightsbridge portion of the Westminster district, an inconsiderable portion only would be benefited by the road, while it would entail upon the ratepayers an annual cost of £900; that roads through royal parks had hitherto been constructed and kept in repair out of the national funds voted for the purpose; and it would be a dangerous and unsafe precedent to take the course, on this occasion, of applying to the purpose the rates levied on the metropolis only, &c.

The CLERK read a report from the committee to whom this matter was referred at the last meeting of the board, submitting plans and estimates for a proposed road across Hyde Park, and recommending that Mr. Cowper be informed that the proposed road through the park would, in the opinion of this board, be a great public convenience during the Exhibition, and to the localities in its vicinity; that this board, however, with every desire to meet the views of the First Commissioner and the public as to this road, regret they have no funds at their disposal to effect this great public improvement; they will, however, be quite prepared to make the same, if Parliament will place at their disposal funds other than those derived from direct taxation for metropolitan improvements, &c. It appeared from statements subsequently made that a communication had been conveyed from the First Commissioner, to the effect that the plan originally before the committee could not be carried out, unless the board consented to build an additional bridge across the Serpentine, and pointing out a more westerly line for the road, through Kensington Gardens.

Mr. LEGG moved the adoption of the report, which was seconded by Mr. HUGHES, who said that the altered circumstances under which the subject came before the board on this occasion would not at all have affected the decision of the committee, had they been aware of them.

Mr. ROBINSON vehemently opposed the project, as well on account of the infringement it contemplated upon the privacy of Kensington Gardens, as of the injustice of expending the rates of the metropolis upon a purely local improvement.

Mr. BENNETT moved, as an amendment—"That this board, having an objection to any road from Bayswater to Knightsbridge which shall destroy the privacy of Kensington Gardens, declines taking any steps for carrying out the same."

Mr. HALL seconded the amendment.

Mr. ROCHE said, there were only two questions to be considered in reference to this matter—first, whether this was a public improvement? and, second, where the necessary funds for carrying it out could be obtained? The committee had answered the first question by their report; and, as to the second, he thought they might ask the Treasury to obtain power from Parliament to transfer to the board, for this purpose, the balance of the coal dues, which the corporation of London were about to pay over, and which, after providing for the new Covent Garden approach, amounted to something like £35,000 or £40,000.

Mr. BIDGOOD said, the circumstances were so entirely altered, that all the arguments previously urged were inapplicable. The present proposition of the First Commissioner was to construct, in fact, a large gutter in Kensington Gardens, along which the public were to be allowed to pass, provided they did not show their heads above the level of the surrounding ground. He was convinced that neither the First Commissioner nor this board could possibly obtain the sanction of Parliament to such a scheme; and he would much rather that the odium of suggesting it should come from Mr. Cowper than from the board.

Mr. FREEMAN could not agree with those who thought this was only a local improvement; but he was altogether adverse to the last proposition, which, instead of carrying the road across the centre of the district, took it to the extreme west, thus depriving it of much of its utility, and destroying one of the noblest gardens in England. The character of the road, too, was such, that it would be emphatically an elongated nuisance, especially after dark.

After several other members had spoken *pro* and *con.*,

The CHAIRMAN ruled that Mr. Bennett's amendment was inadmissible.

Mr. LE BRETON moved another amendment—"That this board is of opinion that a road across Hyde Park, from Victoria Gate to Kensington Gore, would greatly facilitate the public traffic, and would be an important metropolitan improvement; and, having considered the various plans submitted to them by the direction of the First Commissioner, approves of the plan No. 5, for forming a new road along or near the fence of Kensington Gardens, crossing the bridge over the Serpentine on a level, at the estimated cost of £27,526; and this board is prepared to undertake the making of the road, provided the Treasury should be empowered by Act of Parliament to transfer to this board the balance of the coal dues, which the corporation of the City of London are about to pay over to the Treasury; but, if it should be considered necessary hereafter to widen the bridge across the Serpentine, such widening should be effected as a park improvement."

Mr. DOULTON seconded the amendment, which, after a long discussion, was negatived.

Mr. ROCHE proposed a third amendment, adopting the report of the committee, and adding words to the effect that the board would carry out the improvement if the balance of the old coal dues were handed over to them for the purpose.

The CHAIRMAN suggested that it would be better to adopt the report of the committee without such addition, and said he would take care that the First Commissioner was thoroughly informed of the wishes of the board in reference to the balance of the coal dues.

The amendment was thereupon withdrawn; and a subsequent one, by Mr. CRELLIN, to omit the last part of the recommendation of the committee, was negatived.

The original motion was put, and carried by 27 to 7.

UTILIZATION OF LONDON SEWAGE.

This was the day appointed for resuming the consideration of the proposal of the Metropolis Sewage and Essex Reclamation Company, for a concession, upon certain terms submitted by them, of the sewage of the northern area of the metropolis, for a period of fifty years. A very lengthy notice of motion on the subject appeared upon the *agenda*, and several communications had been addressed to the board in reference thereto.

Deputy HARRISON called attention to the fact that on the previous night Mr. Brady had given notice, in the House of Commons, of his intention to move for a select committee to inquire into the best means of utilizing the sewage of the towns of England, with a view to the reduction of local taxation. He, thought, with that fact before them, it would be hardly wise for the board to come to any conclusion on the subject at the present time.

The intimation gave rise to a good deal of conversation; and ultimately, it was resolved to postpone the further consideration of the subject until the select committee have reported.

THE SALE OF GAS ACT.

The CLERK read a report from the committee on Sale of Gas Acts, which stated that they had considered the several tenders which had been received for the erection of a permanent testing-house in Castle Street, Southwark. The board would remember that the estimate for the works, as proposed by the officers of the board, was £1450; and the lowest tender was that of Mr. Nixon, £1787. The committee had conferred with that gentleman in reference to the difference between the estimate and tender, and had also referred the subject to the superintending architect, and Mr. Cresy. They now submitted the report of those gentlemen, and recommended that, subject to the modifications named therein (which reduced the cost to the extent of £189), the tender of Mr. Nixon be accepted. The committee further stated, that they had the satisfaction to inform the board that the temporary testing-house was now in full working order, Mr. T. Glover having at length delivered four of the gasholders ordered of him. The excessive demand upon the part of the manufacturers for stamped meters had now slackened; the inspectors had been enabled to dispose of the arrears, and were keeping pace with the demand made upon them.

The report was agreed to.

FRIDAY, FEB. 21.

At the Meeting of the Board this day, the CHAIRMAN stated, that he had communicated to the First Commissioner the resolution of the last meeting, in reference to the road across Hyde Park. He was also authorized to state that the Government would introduce a bill into Parliament for the purpose of charging upon the coal dues the cost of such road, and hand over its construction to the board.

THE LEEDS TOWN COUNCIL AND THE GAS COMPANIES.

At the Quarterly Meeting of the Leeds Town Council, held on Wednesday, the 12th inst.—the MAYOR (J. Kitson, Esq.) in the chair,

Alderman KELSALL moved—"That the council petition Parliament against the bill to enable the New Gas Company to raise additional capital, to extend their limits for supplying gas, and for other purposes, with a view to obtain the insertion of a clause to enable the council to purchase and carry on the gas-works of the company." He said, he thought they had neglected their duty in not having considered this subject sooner; but, if they now petitioned Parliament, he believed they would be able to come to amicable terms. The New Gas Company were asking for powers to raise £65,000 at 6 per cent., which must come out of the consumers pockets. The council could borrow at 4 per cent.; so that, if they got the power they sought, and Parliament would not allow them to make profits, for £200 they would obtain as much corporation gas as the New Gas Company would supply them with for £300. At present, they had three parties tearing up the roads—the corporation for the water-works, the Old Gas Company, and the New Gas Company; and, as these companies were laying two sets of pipes, they were throwing away 100 per cent., which came out of the pockets of the consumer. It was time that this was put an end to.

Mr. ILLINGWORTH seconded the motion.

Mr. FERNS could not see why the council should petition against the extension of the powers of the gas company, unless it was that they were anxious to create a new staff of officers, for the benefit of a certain portion of the council.

Mr. BROOK supported the resolution, and said it was time the corporation had both the gas companies in their hands. It was monstrous there should be two companies incessantly pulling up the streets, where one company was sufficient; and, even if they had no profits, they would have gas at less cost, and avoid the nuisance of having the streets constantly pulled up.

Mr. TITLEY would vote for the petition, but did not think it desirable that they should attempt at present to buy the new company. They had the full benefits of competition, and the borough was well supplied with gas.

Mr. LUPTON observed that if the council possessed the new company, they would have all the advantages of possessing both; because the old company would have to reduce the price of gas to the same amount at which the corporation supplied it. At least, there would be a saving to the borough of 8 per cent.; and, as he understood the company were quite agreeable to make a sale to the corporation, he thought it desirable that a clause should be inserted enabling them to purchase on fair and equitable terms.

Mr. YEWDALL supported the petition.

Alderman MARCH opposed it, and said it was impossible the council could make gas cheaper than the company could. The price had been reduced as low as was consistent with paying a dividend.

Mr. LOBLEY entered at some length into a comparison of the prices paid for gas at Manchester, Liverpool, and Leeds, with the object of showing that at the former city, where the gas was supplied by the corporation, the charge was greater than at either of the other towns; and, also, that the allowances for discount were even more favourable to Leeds. With regard to lamps, he believed that no town was more reasonably dealt with than Leeds, the average charge per 1000 cubic feet being only 2s. 6½d. If they bought the gas-works, they must pay an enormous sum for them; and, at the present Stock-Exchange rate—even supposing the holders would consent to sell at that price—the value of the shares in the new company would be £360,000, which would increase their debt to nearly £1,000,000.

Alderman LUCCOCK and Mr. CARTER, in reply to Mr. Lobley, stated that in Manchester large sums were appropriated yearly from the profits of the gas-works for carrying out public improvements, &c.; and they contended that it was absurd to suppose that a corporation could not conduct gas-works as profitably as any private and irresponsible company.

Alderman KELSALL said the corporation had to pay 6 per cent. for the water-works, but no one grumbled; and he had no doubt the result of purchasing the gas-works would be as satisfactory and successful as the purchase of the water-works had been.

The TOWN-CLERK read a clause in the Municipal Act, precluding any councillor from voting upon any question in which he was either directly or indirectly interested; and

The MAYOR then put the motion, which was carried unanimously, the councillors having shares in the gas company being necessarily neutral.

The TOWN-CLERK then read the petition, which had been prepared, and it was adopted without discussion.

PARAFFIN, OR COAL-OILS.

Paraffin—or, as this fluid has been frequently termed, coal-oil—has been, for some years past, largely used as an illuminating agent. The cleanliness and the economy of the paraffin-lamps, with the brilliancy of the light produced, have led to their very general adoption, especially in those places where the conveniences of gas have not yet been made available. Paraffin, and, indeed, all the varieties of the oils which are sold under this name, are, like it, compounds of carbon and hydrogen. They are produced by the distillation, at carefully-regulated temperatures, of coal, of certain carbonaceous shales, and the different varieties of petroleum, which are now so largely obtained in America and in Asia.

As we have said, from whatever source derived, these oils are hydrocarbons; and, according to the temperature at which the distillation is effected, there result heavy or light oils, as they are termed by the manufacturers. These oils are of variable specific gravities, and their boiling points range all the way from 46° to 600° Fahr. Hence it is that explosions have arisen from the improper admixture of the lighter oils with the heavier ones. In some cases, this has arisen from insufficient purification of the oil for burning; and in others (which include by far the larger number of cases), by the mixture of volatile oils obtained from other sources with the less inflammable oils distilled from coal. In the early stages of this manufacture, cannel coal was almost exclusively used as the oil-yielding material; but, since the discovery of the oil-wells of Pennsylvania, and other places, petroleum has, in a great measure, supplanted the use of coal; some establishments using the natural oil alone. The object of this is readily appreciated. The petroleum being naturally in a liquid state, there is no necessity for a preliminary distillation, as in the case when coal is used; in which event, the crude oil must be first produced, by exposing the coal to distillation at a low heat, and the resulting product is treated in the same manner as the oil already formed in the wells. By the use of petroleum, the retorts for the first distillation are dispensed with, and thus a saving is effected in apparatus as well as in time and labour.

When petroleum alone is used in the manufacture of kerosene oil, the product contains a much larger proportion of volatile hydrocarbons than when coal is wholly or partially employed; and, therefore, more precautions are necessary, and greater labour is requisite, to effectually get rid of these dangerous substances. Some manufacturers not only neglect to remove these volatile compounds from the oils, but actually purchase the light oils from more conscientious refiners, in order to mix them with heavy oils to make them burn. This is an exceedingly reprehensible practice, and one deserving severe punishment; for the heat generated by the heavy oils in burning vaporizes the volatile portion, and renders it liable at any time to explode.

The oils distilled wholly from coal, or those with which but a small proportion of petroleum has been mingled, are much more easily freed from dangerous portions. By a careful refining, and after distillation steaming, and a large surface of atmospheric exposure, every dangerous compound can be removed; and no fear need be apprehended from oils which are known to be subjected to a rigid and conscientious refining. In purchasing oils, however, nothing should be taken for granted. They should be carefully tested, and their liability to explode fully investigated. The simplest and most satisfactory test of safety is to place the oil in an open dish in a water-bath, and heat it up to 130° to 140° Fahr. If, when elevated to this temperature, on applying a match it does not ignite, it may be pronounced to be very safe. If it ignites but slowly or sluggishly, it is safe. But, any oil that lights quickly in an open dish, at a temperature of below 130° Fahr., may be considered as dangerous. We have seen oil, the vapour of which ignited with a smart puff or explosion at a temperature of 60° Fahr., on holding a lighted match more than one inch above its surface. This was dangerous in the highest degree; and the vendor of such a compound should be held to strict accountability for any accident occurring from its being burned in lamps.

The extensive use of these oil-lamps among the working classes, induces us to call especial attention to this very simple test. To those who may not be provided with a thermometer to measure the temperature, the following simple rule may be adopted:—Pour into a basin a pint of boiling water, and allow it to stand to cool for five minutes. Then, pour some of the paraffin oil into a teaspoon, and, having floated the bulb of the spoon on the hot water, leave it at rest for a few minutes. Then, hold a lighted match a little above the spirit: if it ignite quickly, it is dangerous; if not at all, or very slowly, the paraffin may be used without fear of accident. A metallic fountain or reservoir should always be avoided in using any of these hydrocarbon oils. To show the vast difference of the oils now on sale as paraffin oils in this country, Dr. R. Angus Smith, F.R.S., of Manchester, an eminent chemist, has lately found that oil made by Mr. Young will not ignite in an open vessel at 154° Fahr., while a sample of American rock-oil, sold as paraffin, exploded at a temperature of 46° Fahr.—*Mining Journal.*

NOTE ON THE FORMATION OF PETROLEUM AND ALLIED SUBSTANCES FROM WOODY FIBRE OR ANIMAL TISSUE.

By DR. STERRY HUNT.

[From the "Canadian Naturalist and Geologist."]

It has been stated, in a previous paper, that the different mineral combustibles have been derived from the transformations of vegetable matters, or, in some cases, of animal tissues analogous to these in composition. The composition of woody fibre or cellulose, in its purest state, may be represented by $C_{24}H_{20}O_{20}$, or, as a compound of the elements of water, with carbon; the incrusting matter of vegetable cells, to which the name of lignine has been given, contains, however, a less proportion of oxygen, and more carbon and hydrogen than cellulose; so that, the mean composition of recent woods, as deduced from numerous analyses of various kinds, may be represented by $C_{24}H_{18\cdot4}O_{16\cdot4}$. We may conceive of four different modes of transformation of woody fibre, all of which probably intervene to a greater or less degree in the production of mineral combustibles; and, in considering these changes, we shall, for greater simplicity, adopt, for the composition of woody fibre, the first-named formula, $C_{24}H_{20}O_{20}$.

I. When wood is exposed to the action of moist air, oxygen is absorbed, and carbonic acid and water are evolved in the proportion of one equivalent of the first for two of the last. We may suppose that for H_2, which is oxidized by O_2, from the air, the wood loses CO_2; so that, while the carbon increases in amount, the proportions of oxygen and hydrogen are unchanged. In this way, an equivalent of cellulose, by absorbing sixteen equivalents of oxygen, and losing eight of carbonic acid ($8\ CO_2$), and sixteen of water ($16\ HO$), would leave $C_{16}H_4O_4$. Such is the nature of the decay of wood when exposed to the air; and the process, could it be carried out, would leave a residue of carbon only. If, however, the wood is deeply buried, and excluded from the oxygen of the air, two reactions are conceivable.

II. The whole of the oxygen of the wood may be given off in the form of carbonic acid, while the hydrogen remains with the residual carbon. The abstraction of ten equivalents of carbonic acid from one of woody fibre, would leave a hydrocarbon, $C_{14}H_{20}$.

III. Instead of combining exclusively with the carbon, a part of the oxygen of the wood may be set free as water, in combination of the hydrogen. The abstraction, from an equivalent of woody fibre, of four equivalents of carbonic acid and twelve of water, would leave a hydrocarbon, $C_{20}H_8$.

IV. These decompositions are, however, never so simple as we have supposed in II. and III., for a portion of hydrogen is at the same time evolved in combination with carbon, chiefly as marsh gas, C_2H_4. The amount of this gas evolved from decaying plants submerged in water, and the immense quantities of it condensed in coal-beds and other rocky strata (forming fire-damp), show the great extent to which this mode of decomposition prevails.

In nature, these various modes of decomposition often go on together, or intervene at different stages in the decomposition of the same mass; they are, besides, seldom so complete as we have represented them. The first process results in the formation of vegetable mould, which always retains portions of carbon and hydrogen; while the incomplete operation of the processes II., III., and 14, gives rise to peat, lignite, brown coal, bituminous coal, and pyroschists, in all of which the proportion of the oxygen is much less than the hydrogen, so that their composition may be approximately represented by mixtures of hydrocarbons with vegetable fibre. The following results have been selected from a great number of analyses by various chemists, and are, for the most part, taken from Bischof's "Chemical Geology" (Vol. I., cap. 15). The nitrogen, which, in most cases, was included with the oxygen in the analysis, has been disregarded, and the oxygen and hydrogen, for the sake of comparison, have been calculated for twenty-four equivalents of carbon:—

1.—Vegetable fibre or cellulose	$C_{24}H_{20}O_{20}$
2.—Wood, mean composition	$C_{24}H_{18\cdot4}O_{16\cdot4}$
3.—Peat (Vaux)	$C_{24}H_{14\cdot4}O_{10}$
4.—Ditto (Regnault)	$C_{24}H_{14\cdot4}O_{9\cdot6}$
5.—Brown coal (Schrötter)	$C_{24}H_{14\cdot3}O_{10\cdot5}$
6.—Ditto (Woskresensky)	$C_{24}H_{13}O_{7\cdot6}$
7.—Lignite (Vaux)	$C_{24}H_{11\cdot3}O_{6\cdot4}$
8.—Ditto, passing into mineral resin (Regnault)	$C_{24}H_{12}O_{3\cdot3}$
9.—Bituminous coal (Regnault)	$C_{24}H_{11}O_{3\cdot3}$
10.—Ditto (Regnault)	$C_{24}H_{10}O_{1\cdot7}$
11.—Ditto (ditto)	$C_{24}H_{9\cdot4}O_{1\cdot2}$
12.—Ditto (ditto)	$C_{24}H_9O_{0\cdot9}$
13.—Ditto (Kühnert and Gräger)	$C_{24}H_{7\cdot4}O_{1\cdot3}$
14.—Ditto, mean composition (Johnston)	$C_{24}H_5O_2$—O_4
15.—Albert coal (Wetherell)	$C_{24}H_{15\cdot2}O_{1\cdot6}$
16.—Asphalte Auvergne	$C_{24}H_{17\cdot7}O_{2\cdot2}$
17.—Ditto Naples	$C_{24}H_{14\cdot6}O_2$
18.—Ditto Bastennes	$C_{24}H_{15}O_{0\cdot7}$
19.—Elastic bitumen, Derbyshire (Johnston)	$C_{24}H_{23}O_{0\cdot2}$
20.—Bitumen of Idria	$C_{24}H_9$
21.—Petroleum and naphtha	$C_{24}H_{21}$

In the above table, we see the transition from peat and brown coal to lignite, and thence to bituminous coal. Professor Johnston, from his experiments in various coals, including cannel from Wigan, splint coal from Workington, and caking coal from Newcastle, deduced the composition given in 14, in which, with $C_{24}H_9$, the oxygen varies from two to four equivalents. It will be seen, from a comparison of the infusible Albert coal with the bitumens 16, 17, and 18, how gradual are the transitions to the true petroleums and naphthas, from which oxygen is absent. The asphaltes also, as will be observed, differ very much in their composition, and, though generally much richer in hydrogen than the bituminous coals, the variety from Naples (17), which is completely fusible at 140° C., contains less hydrogen and more oxygen than the Albert coal analyzed by Wetherell; while the idrialine, or bitumen found with the mercury ores of Idria, approaches very nearly in composition to the bituminous coals, 11, 12, and 13, with which many asphaltes may be said to be isomeric. It is, however, probable that these oxygenized bitumens, unlike the coals, are the products of the oxidation of

naphtha or petroleum, by a process similar to that by which resins are derived from vegetable hydrocarbons. These formulas must be taken as representing, not the true equivalents, but only the proportions of the elements in the bodies in question, which are, in most cases, mixtures of various substance. This is especially true of naphtha, which may be taken as the representative of pure unoxidized petroleum, and which is separated, by distillation, into oils of very different boiling-points. The late analyses by Uelsmann of the rectified rock-oil from Sehnde, near Hanover, gave the formula $C_{18}H_{29}$; and, according to De la Rue and Müller, the greater part of the Rangoon petroleum consists of hydrocarbons in which the number of equivalents of hydrogen is a little greater than the carbon; one gave $C_{26}H_{23}$. Associated with these are, however, portions of bodies containing a less proportion of hydrogen; so that, we may conceive the mean composition of petroleum to be represented, as in the preceding table, by equal equivalents of hydrogen and carbon; many forms of solid bitumen also, as ozokerite and hatchetine, have the same general composition.

By referring to what has been said above, it will be seen that the final result of the third process of decomposition of woody fibre, in which, the air being excluded, the oxygen is shared between the carbon and hydrogen, would be $C_{29}H_9$. A similar result would be obtained, with the simultaneous evolution of marsh gas, if we suppose $6\ CO_2 + 8\ HO + 3\ CH_2$ to be removed from an equivalent of woody fibre, leaving $C_{15}H_6 = C_{29}H_3 = C_{24}H_{9\cdot5}$, which approaches the composition of most bituminous coals and of idrialine. A further elimination of marsh gas would leave a residue of pure carbon, and thus, as Bischof has suggested, vegetable matters may be converted into anthracite without the intervention of a high temperature.

The elimination of the whole of the oxygen in the form of carbonic acid would leave a compound with a large excess of hydrogen, of which it would be necessary to remove a portion in the form of water or marsh gas, in order to reduce the residue to the composition of petroleum. We know of no combination of carbon and hydrogen in which the number of atoms of hydrogen surpasses, by more than two, those of hydrogen—the general formula being $CnHn+_2$; so that, oils like $C_{18}H_{30}$ and $C_{26}H_{28}$, contain nearly the maximum quantity of hydrogen, and a body like $C_{14}H_{30}$, whose formation we have supposed above, could not exist, but must break up into marsh gas and some less hydrogenous oil, like petroleum.

We do not know the precise conditions which, in certain strata, favour the production of petroleum rather than of lignite or coal, but, in the fermentation of sugar, to which we may compare the transformations of woody fibre, we find that, under different conditions, it may yield either alcohol and carbonic acid, or butyric and carbonic acids with hydrogen, and, even in certain modified fermentations, the acetic, lactic, and propionic acids, and the higher alcohols, like $C_{10}H_{12}O_2$. These analogies furnish suggestions which may lead to a satisfactory explanation of the peculiar transformation by which, in certain sedimentary strata, organic matters have been converted into bitumen.

ON COLOURS DERIVED FROM COAL-TAR.

By Dr. F. Crace Calvert, F.R.S.

[From a Paper Read before the Society of Arts, Feb. 5, 1862.]

These colours are as interesting for their beauty and brilliancy as for the source from whence they are derived, and present a remarkable instance of the valuable services which abstract science so frequently renders to the material interests of society. How little did even chemists dream that a substance first perceived by Unverdorben in the year 1862, then named *aniline* by Fritsche, and discovered in coal-tar about 1841 by Doctor A. W. Hofmann, would lead to the production of such magnificent colours as aniline purple, magenta, &c! There can be no doubt that it is to the interesting and learned researches of Dr. Hofmann on aniline, that we owe the possession of these splendid colours, and further, it was one of his pupils, Mr. W. A. Perkin, who produced for the first time, on a commercial scale, aniline, and then the splendid purple colour which it is susceptible of yielding. Before describing to you the process patented by Mr. Perkin in 1856 to produce his purple, allow me to lay before you an outline of the present plan followed for obtaining aniline. A carburetted hydrogen, which I mentioned to you in one of my previous papers, called "Benzine" ($C_{12}H_6$), and obtained by the careful distillation of purified coal naphtha at a temperature of about 186°, is treated with strong nitric acid, when a violent action ensues, which gives rise to nitrobenzine or $C_{12}H_5NO_4$. To covert this compound into aniline, 100 parts of nitrobenzine are mixed with an equal quantity of acetic acid, and 200 parts iron filings, heat is produced, and the following chemical action ensues:—

$$\underset{\text{nitrobenzine.}}{C_{12}H_5NO_4} + 2\,\underset{\text{water.}}{HO} + 4\,\underset{\text{iron.}}{Fe} = 2\,\underset{\text{oxide of iron.}}{(Fe_2O_3)} + \underset{\text{aniline.}}{C_{12}H_7N}$$

The whole is then introduced into a retort, and the raw product which passes from it is mixed with a little alkali or lime, and again distilled, when aniline is obtained. This important substance is, as you perceive, a colourless fluid, which boils at 359°, has a decided alkaline reaction, and a sp. gr. of 1·028. The following is the process described by Mr. Perkin for preparing his purple. Solutions containing equivalent proportions of sulphate of aniline and bichromate of potash are mixed and allowed to stand till the reaction is complete. The resulting black precipitate is then thrown on to a filter and washed with water until free from sulphate of potash; it is then dried. This dried product is afterwards digested several times with coal-tar naphtha, until all resinous matter is separated, and the naphtha is no longer coloured brown. After this, it is repeatedly boiled with alcohol to extract the colouring matter. This alcoholic solution when distilled leaves the colouring matter at the bottom of the retort as a beautiful bronze-coloured substance, which may be considered as Mr. Perkin's commercial aniline purple. This colour, which can also be produced by oxidizing aniline by other metallic salts, is slightly soluble in water, freely soluble in alcohol, and presents the remarkable property of not being affected by light, alkalies, or acids. To dye wool or silk with it, it is simply necessary to add to a hot-water bath, slightly acidulated with tartaric acid, some of the alcoholic solution of aniline purple, and to work the silk in the said bath, wringing and washing it; the purple shade thus produced can be modified with rosoine, Prussian blue, or sulphate of indigo. To dye cotton so as to resist the action of soap and light, the process is modified so as to form on the cotton fibre an insoluble compound of colouring matter with tanning and a metallic base. To effect this, the cotton is passed for an hour or two into a bath containing a tanning substance, and then into a weak solution of stannate of soda, wrung out, passed into an acid liquor, rinsed in water, and then, like silk, dipped into an acidulated bath of purple aniline. Also cotton prepared with a basic salt of lead, or as for Turkey red, will take up aniline purple. On the 12th of January 1861, another interesting process to obtain aniline purple was patented by Mr. Adam Girard. Pure red aniline (known in this country as magenta) is mixed with an equal weight of aniline, and the mixture heated for several hours to 329°, when the mass is changed to a fine purple colour, requiring only to be mixed with water and hydrochloric acid, to remove any aniline or red dye in excess, leaving the purple insoluble, but, on being well washed with water, this becomes soluble in alcohol, acetic acid, wood naphtha, and boiling water slightly acidulated with acetic acid.

Whilst on this mode of producing purple aniline, I may say that blue dye may also be obtained with the above insoluble purple residue by boiling it several times with hydrochloric acid diluted, say ten parts of commercial acid to 100 parts of water, when the purple is converted into a blue dye.

Mr. Charles Lauth also published, on the 24th of December, 1860, an ingenious method of obtaining purple aniline, which I shall describe when treating of blue colours obtained from aniline.

Red Dyes obtained from Aniline, called Fuchsine, Azaléine, Roseine, &c.—The production of the fine colour, which bears the popular name of magenta, was first observed by Mr. Natanson, in 1856, and more especially by Dr. Hofmann when preparing cyantriphenyldiamine, by the action of bichloride of carbon on aniline. But it was Mr. Verguin who first brought it forward to the trade as a dyeing agent, and his mode of preparation, which was patented in April, 1859, by Messrs. Renard and Franc, of Lyons, is the following:—Into a glazed iron pan are introduced 100 parts of aniline and 60 parts of anhydrous bichloride of tin, and the whole is heated for 15 or 20 minutes, at a temperature of about 392°. The dark red liquor thus produced is left to cool, when it becomes thick and glutinous; it is then mixed with boiling water and filtered; to the filtrate is added chloride of sodium which determines the precipitation of fuchsine, as it is insoluble in saline solutions. Magenta was afterwards prepared by C. Greville Williams with permanganate of potash, and by Dr. D. Price, with binoxide of lead; nitric acid, and nitrate of mercury were also successfully employed. These different methods of preparing magenta were followed by several other patents, purporting to obtain the same results, and amongst them I may cite that taken on the 10th of December 1859, by Mr. Rudolph Heilman, in which the employment of arsenic acid is mentioned, and one also for the employment of the same agent, on the 18th of January, 1860, by Dr. H. Medlock. As it is probable that this agent is the best suited for producing magenta, commercially, I will give a sketch of the process. Dr. Medlock heats two parts of aniline with one of arsenic acid to about 250°, and when the red colour is produced it is mixed with boiling water and allowed to cool. The red colour is thrown down by saline matter, washed, and dissolved in methylated alcohol, or the mass is digested in hydrochloric acid diluted with water, and the clear fluid solution is saturated with an excess of soda, which precipitates the colour, while the arsenicus acid is held in solution by the alkali. Magenta is a rather powerful organic base, which is sparingly soluble in water, but its solubility is increased by the presence of an acid. It leaves a brittle mass, having a beautiful golden green metallic reflection, when its alcoholic solution is left to spontaneous evaporation, and this is not peculiar to magenta, as the whole of the coal-tar colours, when in a high state of purity, present the same appearance. Purple aniline differs from the red, not only in its composition, which is a follows:—

$$\underset{\text{Purple.}}{C_{35}H_{17}N_3O_2} \qquad \underset{\text{Red.}}{C_{36}H_{20}N_4O_4}$$

but also because the fuchsine dissolves in ammonia and in sulphuric acid with a yellow colour, and is discoloured by sulphurous acid, whilst the purple is unaffected by those reagents. Silk or wool is dyed with fuchsine by simply adding some of the colour to a slightly acidulated bath. The dyeing colour of this material is so great that ten grains will dye two square yards of silk.

Of late years, many attempts have been made to fix another colour obtained from coal-tar, called rosalic acid ($C_{12}H_6O_3$), but up to the present time, I believe, all attempts have failed, with the exception of rosalate of magnesia, which was employed for some time in calico-printing.

Blue Colouring Matters from Coal-Tar.—I have already drawn your attention to the blue colouring matter patented by Mr. Girard, and carried out practically by Messrs. Renard and Franc, of Lyons: Mr. Lauth also has observed that if an alcoholic solution of red aniline, and especially azaléine, is heated with a reducing agent, such as protochloride of tin, or still better, with aldehyde or hyduret of benzoïle, a blue colour is produced even at ordinary temperatures. This blue colour is soluble in water, alcohol, and acetic acid, but does not resist the action of mineral acids, alkalies, or light.

Mr. Willm has recently published an interesting paper on this aniline blue, which not only shows how aldehyde acts, but exhibits the composition of the blue itself:—

$$\underset{\text{Azaléine.}}{2\,(C_{36}H_{20}N_4O_4)} + \underset{\text{Aldehyde.}}{5\,C_4H_4O_2} + \underset{\text{Water.}}{8\,HO}$$

$$= \underset{\text{Blue or Oxyphenylanilide.}}{3\,(C_{34}H_{11}NO_3)} + \underset{\text{Acetate of Ammonia.}}{5\,C_4H_3(NH_4)O_4}$$

Therefore, the triamine azaléine has been transformed into a monamine blue, by a new chemical reaction, for aldehyde not only acts as a reducing agent, but converts a part of the nitrogen into ammonia.

Bleu de Paris.—Recently, Messrs. Persoz, de Luynes and Salvétat, called public attention to a new blue which they had produced, and to which they gave the name of Bleu de Paris; this they prepared by heating for thirty hours, in a sealed tube, at a temperature of 356°, one part of anhydrous bichloride of mercury, with two parts of aniline. The blue thus produced can resist the action of weak acids and alkalies, but assumes a red hue when acted on by these agents in a concentrated state. Sulphurous acid has no action upon it, and it dyes animal fibres with facility.

Bleu de Mulhouse.—MM. Gros-Renaud and Schaeffer have lately published an interesting process for obtaining from the red aniline, called azaléine, a purple and a blue. It consists in dissolving in a litre of boiling water, 50 grammes of white gum lac in powder, and 18 grammes of carbonate of soda, to which is added 50 grammes of an alcoholic solution of azaléine. After an hour's ebullition, the red colour is transformed into the Bleu de Mulhouse.

Azuline.—This beautiful colour, which resists the action of the strongest acids, and which was introduced into this country at the latter end of 1860, by Messrs. Guinon, Marnas, and Bonnet, of Lyons, is prepared by them from phenic acid, and, when pure, presents itself under the form of copper-bronze coloured crystals, soluble in alcohol, to which they communicate a magnificent blue colour, slightly tinged with red. The following is the process for dyeing silk and wool:—To an acidulated lukewarm bath of water an alcoholic solution of azuline is added, and the silk or wool worked in it until it is of the required shade. It is then transferred to another bath of boiling water, strongly acidulated with sulphuric acid, when the purple colour is dissolved, leaving a most brilliant and permanent blue upon the material. The dyed silk or wool is washed repeatedly, passed through a bath containing a little tartaric acid, and dried.

Chinoline Blue.—Mr. C. Greville Williams introduced in the spring of last year a fine blue colour, which he obtained by boiling together a substance derived from quinine or chinchonine, called chinoline, with iodine of amyl. The resulting product is boiled with water and then with potash for a quarter of an hour, filtered to separate the resinous matter, when a gorgeous blue is obtained, with scarcely any shade of red. This colour is so fugitive that its use has ceased.

Green Colours from Aniline.—Although it has been known to chemists that aniline would yield a green colour under certain oxidizing agents, up to the present time all efforts to dye silk or wool commercially with it have failed; but, to avoid having to refer to this green colour again, I may mention that Messrs. Samuel Cliff, Charles Lowe, and myself, patented on the 11th of June, 1860, a most easy and practical method of producing it under the name of *Emeraldine*, on cotton fabrics, specimens of which I have the honour to show you. The process consists in printing an acid chloride of aniline on a cotton fabric prepared with chlorate of potash, and in a few hours a beautiful bright green gradually appears, which only requires to be washed. If the green fabric is passed through a solution of bichromate of potash, this colour is transformed into a dark indigo blue, called by us *azurine*.

Naphthaline Colours.—The beautiful solid hydrocarbon naphthaline, which has yielded such a long category of substances to the chemists, has up to the present time yielded nothing of practical importance to the dyer, with the exception of a case which I shall mention presently. From it the following coloured derivatives have been obtained, namely, chloroxynaphthalic acid, perchloryxynaphthalic acid, carminaphtha, ninaphthalamine nitrosonaphthalin, naphthamein, and a body of a purple colour. It is to Mr. Perkin that we owe the knowledge of several of these substances and their colour-giving properties. In my laboratory a fine purple colour has been obtained from naphthalin, which dyes with facility silk and wool, and the process is so far perfected as to enable me to show you some silk dyed and a piece of calico printed with it.*

A few months ago the scientific world were startled by the announcement, from a French chemist named Z. Roussin, that he believed he had discovered the means of making from naphthaline the important colour-giving principle which I have already mentioned to you when speaking of madder called alizarine, and what strengthened his belief was, that he thought he had succeeded in removing two equivalents of oxygen from binitronaphthaline, and transforming the nitrogen thereof into ammonia, leaving, as a residue, alizarine, as seen by his formula:—

Binitronaphthaline	C_{12}, H_6, N_2, O_8
Minus Oxygen	$-O_2$
Plus Oxygen	$+H_6, H_2$
EQUALS.	
Alizarine	C_{12}, H_8, O_6
Plus Ammonia	N_2, H_6
Plus Water	$2HO$

* Those who may wish for further information on the subject of coal-tar colours, should consult the numbers for June 18th, and July 2, 1861, Vol. X., of this JOURNAL, which contains a valuable paper by Mr. W. A. Perkin.

The simple process which he devised to obtain a crystalline substance which gave a red colour with an alumina mordaunt, consists in dissolving slowly binitronaphthaline in concentrated sulphuric acid, and raising the temperature gradually to 392°, when he adds granulated zinc in successive small portions. After a short time sulphurous acid is given off, and the conversion of binitronaphthaline into a red colouring matter is effected. All that is now required is to dilute the liquor with eight or ten times its volume of water, and carrying it to the boil, filter, and allow the whole to cool, when Mr. Roussin's so-called alizarine deposits under the form of fine red or orange-coloured crystals. Although this product possesses some properties similar to those of alizarine, it differs from it in many of its chemical reactions, and also because it does not furnish the purple and chocolate colours given by alizarine with iron, and iron and alumina mordaunts. Still these results, arrived at by Mr. Roussin, are so remarkable, that it is to be hoped that he will persevere in his endeavours to solve this interesting problem.

I cannot conclude this part of my paper without drawing the attention of those interested in the subject of colours, to a series of valuable papers, which have recently been published in the memoirs of the Institute of France, by my eminent and learned master, M. Chevreul, on the comparative affinity of various colouring matters for different fibres, on the influence of various mordaunts, on divers colouring matters, and, lastly, on the influence of the solar light on such dyed fabrics.

DR. J. NORTHCOTE VINEN'S REPORT ON THE GAS SUPPLIED BY THE SURREY CONSUMERS COMPANY:—

1862. Week ending.	Number of Observations.	Maximum Light. Candles.	Minimum Light. Candles.	Average Light. Candles.
Feb. 8	4	13·72	12·54	13·14
„ 15	4	13·64	11·26	12·38

The average volume of hydrocarbons was 4·50 per cent.; of carbonic acid, 0·75 per cent. There was no trace either of sulphuretted hydrogen or of ammonia.

PRESERVATION OF WOOD FROM DECAY.—To prevent posts and piles from rotting, the following coating has been recommended, which is the more suitable, since it is economical, impermeable to water, and, nearly as hard as stone:—Take 50 parts of rosin, 40 of finely-powdered chalk, 300 parts (or less) of fine white sharp sand, 4 parts of linseed oil, 1 part of native red oxide of copper, and 1 part of sulphuric acid. First, heat the rosin, chalk, sand, and oil in an iron boiler; then add the oxide, and, with care, the acid; stir the composition carefully, and apply the coat while it is still hot. If it be not liquid enough, add a little more oil. This coating, when it is cold and dry, forms a varnish which is as hard as stone.—*Dingler's Polytechnic Journal.*

Dr. PROFIT AND LOSS ACCOUNT OF THE LEIGHTON BUZZARD GAS COMPANY, FOR THE YEAR 1861. *Cr.*

To Stock, Dec. 31, 1860			£ 97 19 2	By Gas and meter-rental		£1574 19 2
Coals and cartage			639 9 4	Coke		227 4 0
Wages and salaries			252 1 0	Ditto, small		16 0 7
Extra labour			14 15 2	Refuse lime		13 19 0
Tradesmen's accounts			106 4 1	Stores		27 5 11
Rates and taxes			47 13 0	Tar		6 3 7
Lime for purifying			47 14 4	Ashes		5 15 3
Petty charges			5 1 7	Carriage		1 4 0
Bankers ditto			4 0 0	Stock in hand, Dec. 31, 1861—		
Balance of profit			760 10 10	Coals—49 tons 10 cwt., at 16s.	£ 39 12 0	
				Coke—400 qrs., at 2s. 6d.	50 0 0	
				Refuse lime—1200 bshls., at 1½d.	7 10 0	
				Tar—4000 galls., at	5 0 0	
				Coke, small—60 bshls., at 2d.	0 10 0	
				Ashes—60 bshls., at 1d.	0 5 0	
						02 17 0
			£1975 8 6			£1975 8 6
				Balance of profit		760 10 10

The paid-up capital of the company is £8956. 10s., upon which a dividend of 7 per cent. has been paid. The reserve-fund amounts to £412. 7s. 6d. The price of gas, which, in 1861, was 5s. 10d. per 1000 feet, has been reduced to 5s. from the commencement of the current year. The public lamps burn 5 feet per hour for 3100 hours per annum, and are charged £2. 15s., including the lighting, extinguishing, cleaning, and repairing.

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1	3 5 0	2 10 0	2 10 0	3 0 0	3 5 0
1¼ and 2-inch Socket-pipes	7 0 0	6 0 0	6 5 0	6 10 0	6 15 0
2½ and 3-inch ditto	6 15 0	5 10 0	5 15 0	6 0 0	6 5 0
5 and 5-inch ditto	6 0 0	5 0 0	5 5 0	5 10 0	5 15 0
6 inches and upwards ditto	5 15 0	4 15 0	5 0 0	5 0 0	5 10 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 15 0	5 0 0	5 5 0
Ditto, 2nd ditto, cold ditto	6 10 0	5 5 0	5 10 0	6 0 0	6 5 0
Tank-plates, ¾ thick and above	6 0 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT-IRON TUBING,

Subject to 40 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 feet—per foot	1 8	1 0	0 10	0 7	0 5	0 4½
Ditto ditto, from 6 inches to 18 inches—each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows (wrought iron)	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, ditto	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	13 0	12 0	—

COALS.—*Per Ton.*

Newcastle.—Unscreened.	6s. 9d.
Whitwell Primrose	
Medomsley, Eighton Moor, and Burnhope	7 0
Pelaw	7 3
New Pelton, Pearth, South Pelaw, Washington Hutton, and South Pearth	7 6
Pelton	7 9
Ramsay's Newcastle Cannel	16 0

Scotch Cannel.	
Boghead (at Leith)	45s. 0d.
Kirkness, best	23 0
Capeldrae, 1st quality	20 0
Ditto, 2nd ditto	12 6
Lesmahago (at Glasgow)	25 0
Ditto (at Leith)	27 6
Arniston	27 6
Wemyss	20 0
Knightswood	18 0
Pirnie	14 0

FREIGHTS.

Coastwise—Newcastle.—Per Ton.	6s. 0d.
Chatham and Rochester	
Cork	10 9
Dover and Folkestone	7 0
Dublin	11 3
Exeter Quay	9 9
Ipswich	6 0
London (Pool)	8 3
Lowestoft and Yarmouth	5s. 0d. to 5 3
Lynn	6 0
Portsmouth and Southampton	8 0
Plymouth	9 0
Shoreham	—
Whitstable	7 3
Weymouth	8 0

Foreign.—Per Keel.	
Barcelona	£25 0s.
Bordeaux	15 10
Boulogne and Calais	9 5
Cadiz	16 10
Cronstadt	—
Copenhagen	—
Genoa	23 10
Hamburg	—
Havre de Grace	9 15
Leghorn	23 0
Lisbon	16 10
Rotterdam	—
Stettin	—
Trieste and Venice	£22. to 25 0

SUNDRIES.

Best Newcastle Fire-bricks—per 1000	£2. 10s. to	£2 15s. 0d.
Cliff's Fire-bricks (at Wortley)—per 1000		2 15 6
Ingham's ditto (at Wortley)—per 1000		2 15 0
Fire-clay Retorts—per foot run	5s. 6d. to	0 7 0
Tough Cake Copper—per ton		102 10 0
English Pig Lead—per ton		20 5 0
Welsh Bar Iron (in London)—per ton		6 5 0
Foreign Spelter—per ton		17 15 0
English Block Tin—per ton		120 0 0
Banca—per ton		124 10 0
Tarred Rope Yarn—per cwt.		1 6 0

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WANTED, by a respectable Young Man, a situation as GAS-FITTER and SERVICE-LAYER. Would like to go abroad. Can have good References.

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WANTED, by a respectable Young Man, a situation in either of the above firms as FITTER, or FITTER and SERVICE-LAYER. Can give good Testimonials from last employers.

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WANTED, a Manager for the Gas- WORKS of BO'NESS, Linlithgowshire. He must have a competent understanding of all the duties of the office. He must superintend, and assist at, the Laying of Service-Pipes, Fix and Repair Meters, Direct the Setting of Retorts, and Keep the Working Accounts.

Persons applying must do so in their own writing, and send only *copies* of Testimonials, as the Advertiser does not undertake to answer all letters, nor to return the testimonials. It is desirable that the person appointed should have had the management of similar works before. Wages, 21s. per week, with house, coal, and gaslight free.

Apply to JOHN ANDERSON, Esq., Bo'ness, LINLITHGOWSHIRE.

TO GAS-WORKS' MANAGERS.

WANTED, immediately, a Man to take the MANAGEMENT of Gas-Works for a village in Bedfordshire, where the whole of the duties will have to be performed by the person appointed. He must, therefore, be able to Lay Services, Fix and Repair Meters, Direct the Setting of Retorts, and Keep the Working Accounts.

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Apply to GEORGE BOWER, Engineer and Contractor, St. Neot's, HUNTS.

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NOTICE is hereby given, that the ADJOURNED HALF-YEARLY GENERAL MEETING of PROPRIETORS, holding, previous to November 26 last, Five Shares and upwards in the said Company, will be held, pursuant to the Act of Incorporation, on WEDNESDAY, the 26th instant, at Twelve for One o'clock, at the Bridge House Hotel, in the Borough of Southwark, for the purpose of declaring a Dividend to Christmas last, to elect Directors and Auditors for the ensuing year, and on other business.

By order of the Court of Directors,
CHARLES PRIDDEN, Secretary.

70, Bankside, Southwark, S.E.
February 10, 1862.

The Dividend will be clear of Income-Tax, and will be payable immediately after the business of the meeting has terminated; and afterwards at the Company's Office, at Bankside, on Thursday, the 27th instant, and also on Monday, the 3rd proximo, on both days from the hour of Twelve till Three, and from that time on Wednesdays only, from Two till Four o'clock.

PORTABLE Steam Boilers on Wheels, constructed expressly for Gas-Works.

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These Boilers are supplied to the chief Gas Companies in Britain and on the Continent.

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This is the most simple machine of the kind in use, being merely a double-action Pump, which any one can comprehend, and works for years without any repair.

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A workman cannot, by any possibility, make the mistake of shutting one passage without opening another; thus ensuring a constant flow of the gas.

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Also, his CONCENTRIC GOVERNOR, which stands in half the space of the ordinary Governor, and regulates the flow of Gas to the greatest nicety.

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I am, dear Sirs, your obedient servant,
CHARLES THOMAS, Superintendent,
Rye Gas-Works.

Messrs. Cutler and Co.

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W. R. invites the attention of those preferring the Wet Meter to his patented improvements therein, which consist in contracting the Chambers of the Measuring-Wheel, at and near the Water-Line, thus allowing of a longer range for the Float, and avoiding the sudden extinctions so common; and a simple remedy is applied to prevent the fraudulent consumption of Gas, which the operation of the recent Sales of Gas Act has so much facilitated.

The workmanship and materials are such as to leave nothing to desire.

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PATENT

SELF-ACTING GAS GOVERNOR.

This Instrument, which is designed to replace the ordinary Governor,

Operates solely by the Action of the Gas, without any Alteration of Weights, or the Assistance of any intermediate Agency or Apparatus whatever;

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NB. A quantity of best Clay Retorts in stock, viz.—Circulars, 14 inches, 15 inches. 16 inches.
D's, 16×12, 15×14, 20×16, 16×18.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

BELGIAN CLAY RETORTS.

ALBERT KELLER, Ghent.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Albert Keller, of Ghent, begs to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by him. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communiations, addressed to ALBERT KELLER GHENT, will receive immediate attention.

WEST and GREGSON, Gas-Meter MANUFACTURERS, &c.
UNION STREET, OLDHAM.

Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide Valves, &c. &c.

W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

F. & C. OSLER,
45, OXFORD STREET, LONDON;
Manufactory—Broad Street, Birmingham—Established 1807,
MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.

ELEGANT CRYSTAL GLASS CHANDELIERS, for GAS, from £4 upwards (Made from "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.

THEATRES, CONCERT, ASSEMBLY, AND BALL ROOMS LIGHTED BY ESTIMATE ON THE LOWEST TERMS.

WALKERS' GAS-VALVES

HAVE BEEN
DURING THE PAST TWENTY-FIVE YEARS,
USED IN UPWARDS OF
450 BRITISH and FOREIGN GAS-WORKS.

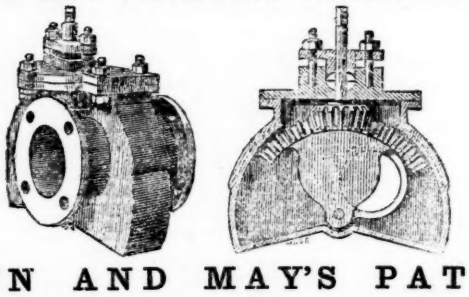
They are made in the most SOLID, SUBSTANTIAL manner, with PLANED and SURFACED JOINTS, and SCRAPED SURFACES. They have a CLEAR, FULL BORE, in a STRAIGHT LINE of PIPE, and are TIGHT to PERFECTION.

Engineers are requested to insert "Valves of Walkers' Manufacture" in their Specifications, by which they will be absolutely certain of the above important advantages. They can name the construction of Valve they prefer best, as Walkers make them of every description—either Walkers SCREW-VALVES, for the Gas-Works or for Street-Mains; INTERNAL RACK-VALVES; or the ORDINARY RACK and PINION-VALVES. REGULATING-VALVES, with INDICATING COLUMNS, &c.

Walkers' London Manufactory is devoted entirely to the above class of work, of which their make is nearly double that of any other British house.

Prices, &c., on Application.
LITTLE SUTTON STREET, LONDON, E.C.

BEST AND CHEAPEST SLUICE-COCK.



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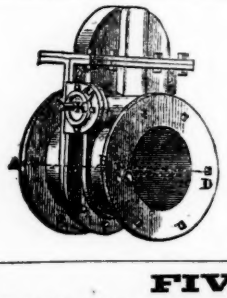
Above 3-inch diameter, price 10s. per inch. Brass face, 6d. eri nch extra.

Can be taken to pieces without being removed rom the line of Piping.

NORTH WILTS FOUNDRY, DEVIZES.

Wholesale Agents, Messrs. S. and E. RANSOME, 31, Essex Street, Strand, E.C., Where a Sample may be seen.



BRYAN DONKIN & CO.
keep always on stock their
IMPROVED GAS VALVES
rom 2 inches to 18 inches, price 11s. 6d. to 13s. 6d. per inch diameter

List of prices, with full dimensions of all sizes up to 30 inches, to be had on application.

Also, Valves for the Works, with Outside Racks and Pinions.

These Valves are all proved to 30 lbs. on the square inch before leaving the works.

BRYAN DONKIN & CO.,
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NEAR GRANGE ROAD, BERMONDSEY.

FIVE HUNDRED
HOLMAN'S PATENT DOUBLE-ACTION PUMPS

Prove their general adaptation. They are adopted by
CIVIL, MARINE, MANUFACTURING, AND MECHANICAL ENGINEERS.

For Pumping TAR, AMMONIACAL LIQUOR, WATER, WORT, and other fluids, their intrinsic excellence is too well known to need description.

S. HOLMAN tenders his hearty thanks to all Patrons, and is prepared to undertake the Supply of Towns, Public and Private Establishments, and Irrigation of Lands, on any scale.

Sole London Agent of the Williams's Perran Foundry Company, for the Sale of Cornish Pumping, Winding, and other Steam-Engines, heavy Machinery, Castings, and Forgings.

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ALL KINDS OF HYDRAULIC AND STEAM MACHINERY FOR HOME USE OR EXPORT.

Illustrated Catalogues free.

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LAMP-POSTS suitable for entrances to Public Buildings, as well as ordinary street lighting, in upwards of 100 different patterns.

GLOBULAR LAMPS of superior manufacture, in Copper, Tin, Cast and Wrought Iron.

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IMPROVED MACHINE-MADE BURNERS
WROUGHT-IRON BATSWINGS,
FOR RAILWAY STATIONS AND MARKETS,
GAS-FITTINGS, CHANDELIERS,
BRASS AND IRON TUBES OF EVERY KIND
SUPPLIED ON THE BEST TERMS,
AT THE WORKS,
9, 10, 11, BARTHOLOMEW STREET,
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PATENT BITUMENIZED PIPES for GAS, WATER, and DRAINAGE.—Reduction in Price on account of the exemption from Duty on Paper.—These Pipes possess all the properties necessary for the conveyance of Water and Gas, and also for Drainage purposes—viz., great strength, great durability, and perfect inoxidability; and, being non-conductors, are not affected by frost like metal pipes. They are proved to resist a pressure of 220 lbs. on the square inch (equal to 500 ft. head of water), and can be made up to any greater strength, if required. They are only one-fourth the weight, and, when laid down, are 50 per cent. cheaper than iron pipes. They are made in 7-ft. lengths, and the joinings are simple and inexpensive. For Gas, these pipes are invaluable, the lining effectually resisting the action of gas deposits; and, being non-conductors, there can be no condensation in them; and the joints are so secure as to entirely prevent any loss from leakage. The mode of inserting service-pipes is also simple and effective. Those laid down in Paris three years ago for the conveyance of Gas have been taken up as perfect as when they were first laid down.

Further particulars as to joining, &c., and specimen Pipes, may be obtained at the office of the Company on application to Mr. ALEXANDER YOUNG, 14, Cannon Street, E.C., LONDON.

WALTER FORD,
LATE
PADDON and FORD,
GAS-METER AND APPARATUS WORKS,
GRAY'S INN ROAD, LONDON.
MANUFACTURER OF WET AND DRY GAS-METERS, STATION-METERS, GOVERNORS, &c. &c.

A large number of **STATION-METERS,** up to 80,000 feet per hour (being by far the largest in use), and **GOVERNORS** for **MAINS,** up to 24 inches, have been constructed by Paddon and Ford. These Meters and Governors possess peculiar advantages as regards strength and freedom of action.

Sole Manufacturer of **PADDON'S PATENT STREET-LAMP REGULATORS,** for insuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

THE ALPHA TUBE WORKS,
WALSALL, STAFFORDSHIRE. ESTABLISHED 1830.
LAMBERT, BROTHERS,
MANUFACTURERS OF
WROUGHT-IRON TUBE AND FITTINGS,
For Gas and High-pressure Water and Steam.

EDWIN DIXON,
WOLVERHAMPTON PATENT WROUGHT-IRON TUBE WORKS,
Originally established in 1833,
Manufacturer of Gas and other Tubes, Fittings, and articles of every description belonging to Gas, Water, or Steam.

E. D. had the honour of receiving the
PRIZE MEDAL
warded to this Manufacture by the COUNCIL of the GREAT ENGLISH EXHIBITION of 1851; and from he latter date has supplied many towns exclusively with GALVANIZED and other Tubes for Gas and Water, under GOVERNMENT ENGINEERS.

A City, containing 150,000 inhabitants,
has recently been entirely supplied with Tubes made at the above-named Works, and several others with populations nearly as great; in fact, the reputation now acquired induces this notice to the public.
Large Stocks generally on hand, averaging from one to three hundred thousand feet.

HYDRAULIC PRESS TUBES,
to resist 6000 lbs. and upwards to the square inch, extensively manufactured.

STOCK DIES and SCREWING TACKLE
of the best possible descripton.
Every Tube carefully tested with Hydraulic Pressure before leaving the Works.

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IRON MERCHANT AND AGENT,
AND
Wholesale and Retail Charcoal and Coke Dealer, and Grinder,
12 & 31, BANKSIDE, & GREAT SUFFOLK STREET, SOUTHWARK, S.E.

ALL GOODS KEPT IN STOCK, AND SUPPLIED AT MANUFACTURERS PRICES.

Cast-Iron Socket, Flanch, Hot Water-Pipes and Connexions, for Gas, Water, and Steam purposes, Rain-Water-Pipes and Guttering, &c. Furnace-Pans and Stable-Fittings. Retorts, Hydraulic Main, Furnace-Work, &c. Lamp-Columns, Lanterns, Cocks and Burners, Wrought-Iron Tubing, &c., of best description. Screw-Cocks, Sluices, and Gas-Valves of every description. Bar, Rod, Plate, and Hoop-Iron Bolts and Nuts. Cast-Iron Columns, Girders, Street-Posts, Watering-Posts, Gutters, Gratings and Railing-Bars, Tank-Plates, and Pump-Castings. Engine, Mill, and Lathe Castings. Planing, Turning, and Boring executed. Cast-Iron Pans, for Soap and Chemical Works. Galvanized Cast-Iron Jars and Pots, for Sugar Refiners. Stourbridge and Newcastle Fire-Bricks, Retorts, Lumps, Tiles, and Clay. Malleable Iron Castings. Pipe-Laying by Contract. Double-Refined Machinery Oil. Iron Borings. Salammoniac and Sulphur.

Castings made in Town or Country, on the shortest notice, to Sketches, Drawings, or Patterns.

Best Animal Charcoal, for Sugar Refiners, and Case-Hardening.

Best prepared Wood Charcoal. Prepared Fuel for Smokeless Stoves guaranteed. Granulated Charcoal for Air and Water Filters. Chemists and Druggists supplied with Pulverized Carbon. Charcoal and Coke Blacking, and Coal-Dust, and superior strong Coke, for Foundry purposes. Gypsum of the finest and purest quality. Sulphate of Ammonia.

Estimates given, and Orders by Post punctually attended to the same day.

AGENT FOR
BECK'S PATENT STOP-VALVES,
For Gas, Water, Steam, and General Purposes, and
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(LATE OF DUDLEY),
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PATENTEE OF THE VERTICAL OVEN RETORT
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JAMES OAKES and CO.,
ALFRETON IRON WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20, WHARF ROAD, CITY ROAD, LONDON,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including best cold-blast Iron Retorts, Socket and Flange Pipes of all sizes, Bends, Branches, Syphons, Lamp Columns of various patterns, &c.

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C. H. is prepared to carry out the warming and ventilation of public buildings, &c.; also civil engineering in general.

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Manufactory for every description of Casting and Machinery for Gas Works and Water Works.
Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.
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Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.
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Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, T-pieces, &c. &c.
Plans, Specifications, and Estimates prepared.

GAS Stoves, Gas Baths, Gas Cooking APPARATUS, warranted the best in England at PHILLIPS'S, the original inventor and manufacturer, and general gas-fitter, &c., 55, Skinner Street, Snow Hill, LONDON, E.C.
PATENT SAFETY ATLAS CHANDELIERS, Sun and Star Burners, Outside Lamps, Patent Reflecting Lamps, Portable Coppers for either Gas or Fuel. Iron Tube and Fittings. Best quality for Gas, Steam, or Hot Water, &c. &c.

STOURBRIDGE FIRE-CLAY WORKS.
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(Contractors to Government).
24 WHARF, HARROW ROAD, PADDINGTON, W.
Every article manufactured at their own Works and Mines, Brierley Hill.
FIRE-BRICKS, Lumps, Squares, Tiles, and Gas Retorts of all dimensions.
CRUCIBLE and CEMENT CLAYS.
GARDEN EDGINGS, of various patterns.
BUFF and ORNAMENTAL TILES.
CLINKERS and STABLE PAVINGS, noted for hardness and durability, being perfectly non-absorbent.
Shipments on the shortest notice.

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DEEPDALE FIRE-CLAY & BRICK WORKS,
Near DUDLEY,
Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.
FIRE-CLAY RETORTS,
TO MODEL OR DRAWING.
B. G. begs to call the attention of Gas Companies to his Fire-Clay Retorts, which have been used with great satisfaction in some of the largest Gas-Works in the Metropolis and many Provincial Towns in England.
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MANUFACTURERS OF

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WROUGHT-IRON TUBES, FOR GAS, WATER, & STEAM; CAST-IRON RETORTS & PIPES;

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Contractors for Gas-Works of any Magnitude. *Plans, Specifications, and Estimates furnished.*

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WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

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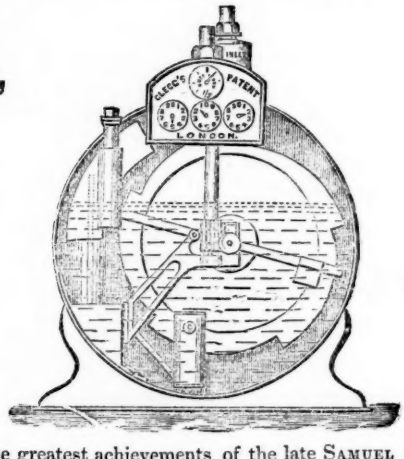
NEW PATENT HYDRAULIC GAS-METER.

BISCHOFF, BROWN, & CO.,

MANUFACTURERS

AND

SOLE LICENSEES,



LANGHAM WORKS,

GEORGE STREET,

GREAT PORTLAND STREET,

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This Meter is the last and one of the greatest achievements of the late SAMUEL CLEGG, C.E., in his connexion with the Manufacture and use of Gas, and, without presumption, it may be confidently affirmed to be the only Meter extant that can be relied upon to measure correctly, to work with the minimum of pressure, and steadiness of light. It cannot be tampered with by tilting or otherwise, and will be of great durability.

This Meter is constructed on an entirely new principle, and, when once adjusted, will always remain the same under all circumstances. The quantity or height of the water in it has no effect on its *capacity*. The immense importance and economy of this to Gas Companies who are obliged to employ so many inspectors, is so obvious, that they will be able to appreciate its advantages over all othe Wet Meters, where the varying height of the water regulates the capacity.

The Drum, from its peculiar construction, presents scarcely any resistance when moving through the water; and, its weight being taken off its axis by an air vessel, it revolves with the slightest pressure.

The comparative absence of friction in the Drum reduces the wear and tear, and enables it to be made of the strongest materials, which will keep it in working order longer than any other Meter.

It is approved and adopted by the principal London and Country Gas Companies, and is guaranteed to comply with the "Sale of Gas Act," as this Meter, beyond all doubt, works within a shorter range of registration than any other Meter manufactured.

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is v ariable

MANUFACTURED BY

I. BRIGGS,

(Late CROSLEY & CO.,)

GAS-METER MANUFACTURER,

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N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturer of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturer of EXPERIMENT METERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c., &c., similar to those used by Mr. King, of Liverpool.

I. BRIGGS is also prepared to supply Gas Companies and others with

DUPLICATES of Mr. KING'S CUBIC FOOT TRANSFERRER,

similar to that manufactured by Crosley & Co., and verified by the ASTRONOMER-ROYAL, and PROFESSOR MILLER, of Cambridge, on behalf of the Government, which was deposited by them in the Office of the COMPTROLLER-GENERAL of the EXCHEQUER, before Nov. 13, 1859, in compliance with the "Act for Regulating Measures used in Sales of Gas." He also supplies

TEST GASHOLDERS,

Graduated by the Standard Cubic Foot.

TRUSS'S PATENT ELASTIC PIPE-JOINT,

FOR GAS AND WATER-MAINS, AND STEAM PIPING,

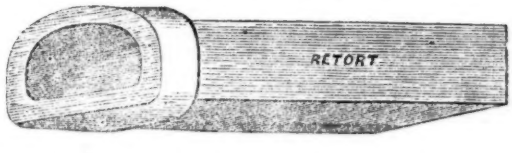
Is the only PERFECT joint that has ever been constructed, and supplies the long-felt desideratum, by allowing for the expansion and contraction of metals, and for oscillation and deflection, without impairing the joint. Gas Companies will effect an incalculable saving in adopting it, as compared with the present imperfect mode of jointing.

Drawings, Estimates, and every particular, furnished on application to

THOMAS SEAVILLE TRUSS, C.E., 53, GRACECHURCH STREET, LONDON, E.C.

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.



KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

FIRE-CLAY GAS RETORTS.

ESTABLISHED IN 1795.

JOSEPH CLIFF,

WORTLEY FIRE-BRICK WORKS, near LEEDS.

THESE RETORTS are unrivalled in excellence, being the BEST FINISHED INTERNALLY, and THE MOST CORRECT IN FORM, of any in the Kingdom. From the peculiar composition used in working up the face of the material, they are rendered unusually smooth, close, and FREE FROM SURFACE CRACKS, thus, in a great measure, preventing leakage and the adhesion of carbon to their interior surface.

To meet the yearly increasing demand of UPWARDS OF THIRTY SEASONS and to carry out the late improvements in the manufacture, the Premises have been re-erected and much enlarged, and Engineers may rely WITH CONFIDENCE on their orders being completed with a greater regard to despatch than by any other House.

THE WORKS ARE WELL SITUATED

For EXPORT from the Ports of { **LONDON, LIVERPOOL, HULL, MIDDLESBRO', HARTLEPOOL, and STOCKTON.**

FIRE-BRICKS, LUMPS, GUARDS, TILES, AND CLAY OF THE SAME QUALITY.

M. P. NEWTON, London Agent, No. 4, Wharf, King's Cross Goods Station.